IMACS-200
System Reference Guide

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ZHONE™

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Product Description

Release 1.0.0 is the first software release for the IMACS-200 platform. The IMACS-200 offers a sub-set of the traditional IMACS interfaces optimized for use in smaller locations. It also is designed to operate over an extended temperature range such that it can be installed in locations that do not provide a controlled environment. The same "look and feel" of the IMACS has been maintained for this new product offering so that those familiar with the IMACS product line will quickly be able to configure and successfully deploy the IMACS-200. Highlights of this new product offering are outlined below.

Features in this Release

- Data capability: Four LD-SRU ports are included.
- Voice ports: Four 2-wire E&M and four FXS ports are included in the IMACS-200.
- Ethernet and RS-232 craft ports
- WAN capability for Four T1 interfaces is included.
- Two V.35 interfaces are included.
- Four alarm outputs and four external telemetry inputs are included.
- Two Optical HSU ports capability is offered as an option conforming to IEEE 37.94 Standard.
- Redundant power supplies of -48VDC, -125VDC, 120VAC or 220VAC are offered as an option.

System ports

IMACS-200 Initialization and Control

The IMACS-200 initializes and controls the system on power up. It performs the following functions:

- Initializes the system upon power-up, and runs a self-test on all ports.
- Polls all ports in the system to determine their operating status.
- Processes all incoming operator commands and displays the responses in a series of operator interface screens for each port in the system. The operator interface system (local VT-100 terminal, remote computer, or network management system) connects to the Serial Interface port, which sends these commands for processing.
- Includes circuitry that allows you to cross-connect DS0 time slots between T1 lines connected to system WAN ports. Refer to the DS0 time slot assignment operations.

- Includes a test pattern generator for T1 line test purposes.
- Enables Ethernet connection for remote management, configuration and downloading of host code via a 10baseT Ethernet port. To setup the Ethernet port, see “Setting Up the Ethernet Port” on page 9 of Chapter 4, *General Features*. To download and activate new software, see “Loading the Software Image Using the Ethernet Port” on page 23 of Chapter 4, *General Features.*

System Reference Guide

This System Reference Guide assists technicians in unpacking, assembling, installing, configuring, and operating the integrated access device.

Chapter 1. *System Overview*

Chapter 2. *System Installation*

Chapter 3. *System Configuration and Operation*

Chapter 4. *General Features*

Chapter 5. *WAN Ports*

Chapter 6. *FXS Ports*

Chapter 7. *E&M Ports*

Chapter 8. *Sub Rate Data Ports (SRU)*

Chapter 9. *High Speed Data Ports (HSU)*

Chapter 10. *Optical High Speed Data Ports (OHSU)*

Chapter 11. *Alarms*

Chapter 12. *System Testing and Diagnostics*

Appendix A. *System Specifications*

Appendix B. *Error Messages*

Glossary

Customer Service and Ordering Information

Technical support

If you require assistance with the installation or operation of your product, or if you want to return a product for repair under warranty, contact Zhone customer service. The contact information is as follows:

E-mail	support@zhone.com
Telephone (North America)	877-ZHONE20
Telephone (International)	510-777-7133
Internet	www.zhone.com/support

If you purchased the product from an authorized dealer, distributor, Value Added Reseller (VAR), or third party, contact that supplier for technical assistance and warranty support.

Service requirements

If the product malfunctions, all repairs must be performed by the manufacturer or a Zhone-authorized agent. It is the responsibility of users requiring service to report the need for service to Zhone customer service.

Safety Information and Precautions

The equipment is designed and manufactured in compliance with the European Safety Standard EN60950 and the Unites States UL60950 Safety Standards. However, the following precautions should be observed to ensure personal safety during installation or service, and prevent damage to the equipment or equipment to be connected.

Read and follow all warning notices and instructions marked on the product or included in this Reference Guide.

Only qualified technicians should perform these tasks.

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

4. Use caution when installing or modifying telephone lines.

5. See the UL Statement for Voice ports.

6. Never attempt to open the case.

7. The AC versions of this product is intended to be used with a three-wire grounding type plug - a plug which has a grounding pin. This is a safety feature. Equipment grounding is vital to ensure safe operation. Do not defeat the purpose of the grounding type plug by modifying the plug or using an adapter.

   Prior to installation, use an outlet tester or a voltmeter to check the AC receptacle for the presence of earth ground. If the receptacle is not properly grounded, the installation must not continue until a qualified electrician has corrected the problem. If a three-wire grounding type power source is not available, consult a qualified electrician to determine another method of grounding the equipment.

   The DC versions of this product must be connected properly with the -VDC and return (RTN) leads. The grounding screw provided on the right rear of the chassis should be connected to frame ground.

8. Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered.

9. **DO NOT** allow anything to rest on the power cord and do not locate the product where persons could step on or walk on the power cord.

10. **DO NOT** attempt to service this product yourself. Refer all servicing to qualified service personnel.

11. Special cables, which may be required by the regulatory inspection authority for the installation site, are the responsibility of the customer.

12. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.

13. A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings. If products installed in separate buildings are **interconnected**, the voltage potential may cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists and, if necessary, implement corrective action prior to interconnecting the products.

WARNING!

This equipment has been tested and found to comply with the limits for a Class "A" Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with this Reference Guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

The authority to operate this equipment is conditioned by the requirement that no modifications will be made to the equipment unless the changes or modifications are expressly approved by the manufacturer.

Disclaimer for Shielded Cables

This equipment was tested with shielded input/output and interface cables. It is recommended that shielded cables be used to reduce interference whenever interference is suspected.

Panel and Cover Removal

Only qualified service technicians should attempt the removal of the cover.

Power Source

Please refer to *Appendix A, System Specifications* in the later in this guide regarding System Requirements.

Ordering Guide

Following is a list of ordering codes for the IMACS-200.

IMACS-200 Ordering Guide

Model Number	Description
IMACS-200-48VDC	IMACS-200 System with a single -48 VDC power supply
IMACS-200-RDNT-48VDC	IMACS-200 System with two -48 VDC power supplies
IMACS-200-48VDC-OHSU	IMACS-200 System with a single -48 VDC power supply and a 2 port OHSU daughter card
IMACS-200-RDNT-48VDC-OHSU	IMACS-200 System with two -48 VDC power supplies and a 2 port OHSU daughter card
IMACS-200-AC	IMACS-200 System with a single 120/220 VAC power supply
IMACS-200-RDNT-AC	IMACS-200 System with two 120/220 VAC power supplies
IMACS-200-AC-OHSU	IMACS-200 System with a single 120/220 VAC power supply and a 2 port OHSU daughter card
IMACS-200-RDNT-AC-OHSU	IMACS-200 System with two 120/220 VAC power supplies and a 2 port OHSU daughter card
IMACS-200-125VDC	IMACS-200 System with a single -125 VDC power supply
IMACS-200-RDNT-125VDC	IMACS-200 System with two -125 VDC power supplies
IMACS-200-125VDC-OHSU	IMACS-200 System with a single -125 Vdc power supply and a 2 port OHSU daughter card
IMACS-200-RDNT-125VDC-OHSU	IMACS-200 System with two -125 VDC power supplies and a 2 port OHSU daughter card

Available Cabling

Table 1 describes the cables recommended for use with the IMACS-200 unit.

Note: Zhone recommends that shielded cables be used to reduce interference that can be caused by lightning surge interference.

Table 1. Recommended cables

Cable	Used for	Manufacturer Part Number	Description
Voice	FXS ports E&M ports Alarm contacts	1210	50-pin Amphenol (M) to 50 pin Amphenol (M) (5')
Data	Sub Rate Data Port RS-530	1216F or 1216M	DB25F to RJ48M **or** DB25M to RJ48M (Straight through) (5')
Data	Async/sync High Speed Data V.35 port	1261F or 1261M	DB25M to V.35F **or** DB25M to V.35M (5’)
Data	Serial (craft) port	1219F	RJ48M to DB9F (25’)
AC Power	AC Power Input	150-00041-01	AC Power Cable (6')
Ethernet	Ethernet port	Standard	RJ45

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Chapter 1
System Overview

1.1 Introduction

This chapter describes chassis used by the IMACS-200.

The IMACS-200 is available with redundant power supplies which operate in a load-sharing mode.

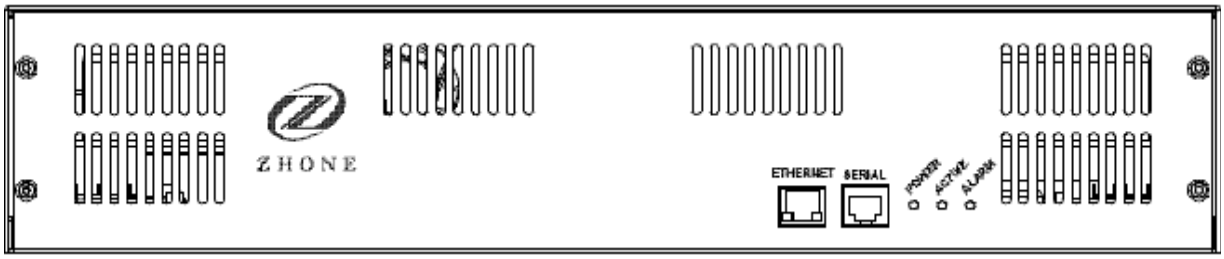
The IMACS-200 chassis is manufactured to be RoHS-compliant.

The IMACS-200 comes “Industrial hardened” to operate under more extreme temperature ranges of -40 degrees Celsius to +70 degrees Celsius (-104 degrees Fahrenheit to +158 degrees Fahrenheit).

1.1.1 IMACS-200 Chassis

This chassis is designed for table top, wall or rack mounting. All voice and data port access is from the rear of the chassis. The craft interface and alarm indication LEDs are located on the front of the IMACS-200 unit, as seen in Figure 1-1. The IMACS-200 features an on-board ringing generator.

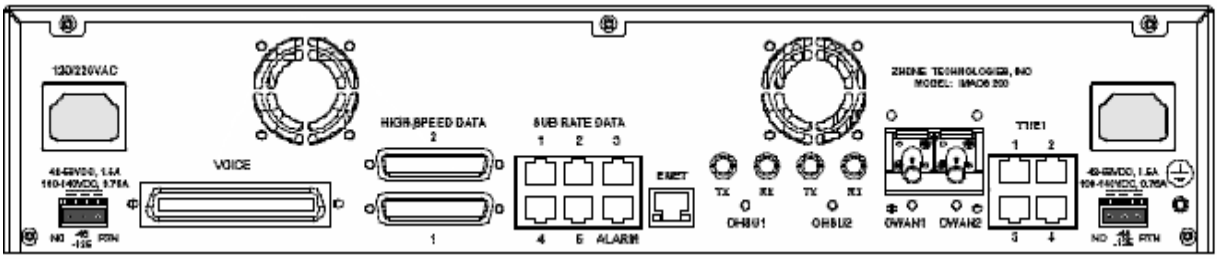
Figure 1-1.IMACS-200 Front Panel



The power supply offering with the IMACS-200 comes with either one or two power supplies. One power supply is capable of handling all the power needs for the unit. When ordering a unit with a redundant power supply, the IMACS-200 operates in a load sharing mode. Should one of the two units fail, the other unit will immediately take over powering of the IMACS-200.

The IMACS-200 offers a range of power input options, which are selected to be the most commonly used input voltages in use by our various customers. They are: -48VDC, -125VDC, 120VAC and 220VAC. The power supply modules are factory installed, and will come with the proper connectors configured for the IMACS-200 powering options you have selected. The power inputs are to the right and left rear of the IMACS-200, and labeled accordingly. In Figure 1-2, the supply inputs are seen on the sides of the rear panel.

Figure 1-2.IMACS-200 Rear Panel



Notes:

1. The two -48VDC and -125VDC feeds are located in the lower-left and lower-right hand corners of the IMACS-200 rear panel. Based on ordering options, these ports will arrive at the customer site with screw-down terminals contained in an accessory bag in the IMACS-200 packaging. For customers who order the single-supply option, the right-hand connector above (nearest the T1/E1 and ground screw) should be used. These three-pin terminals (if so equipped) are labelled left-to-right as NC (No Connection), -48 or -125 as the case may be, and RTN (return).

2. The two 120VAC and 220VAC feeds are located in the upper-left and upper-right hand corners of the IMACS-200 rear panel. Based on ordering options, these ports will arrive at the customer site with AC jacks installed. Simply place a North-American AC power supply cord into the supplied jacks.

3. The IMACS-200 comes with two fan units installed in the unit. These fans will turn on and off automatically as the temperature fluctuates inside the enclosure. These fans are not field serviceable, and will alarm should one of them fail or become obstructed.

A more detailed description of this chassis and its power capabilities is given in chapter 3.

Chapter 2
System Installation

2.1 Introduction

This chapter provides instructions for unpacking and installing the IMACS-200 chassis at the user site. It also includes other information you will need to properly install the system and refers you to other chapters for additional port-level information.

The system can operate on either AC or DC power when equipped with the proper power supply. Refer to the system specifications section in this manual regarding electrical and environmental requirements.

2.2 Chassis Installation

2.2.1 Unpacking the Chassis

When you receive your system, unpack the box and check the contents for damage. Inside the box you should have the following three items:

1. The IMACS-200 system
2. A CD ROM with the documentation for the latest or ordered release.
3. A poly bag including the mounting hardware and power cord(s) and or connector(s).

If any of the items above are missing, please contact your sales representative. If anything is damaged, contact the shipping carrier to file a claim. The carrier representative will also tell you how to submit a claim, where to send the unit, and give you any special instructions you may need.

Pack the damaged item in its original packing materials and send it by prepaid freight to the address you received. If the original packing materials are unavailable, pack the unit in a sturdy box and surround it with shock-absorbing material.

2.2.2 Pre-Installation Tips

2.2.2.1 Installation Checklist

Install your IMACS-200 in the following sequence:

1. Choose a suitable location for the system, as described in this chapter.
2. Unpack and inspect the equipment for damage.
3. Mount the chassis on the desired surface (rack, tabletop, or wall).
4. Install the chassis ground connections.
5. Verify the voltage ratings of all power supplies in the chassis.
6. Verify the fuse ratings of the source power supply.
7. Apply power to the system and verify the power LED states.

After successfully installing the system, configure the system for operation as follows:

1. Connect a VT100-compatible terminal to the Interface port.
2. Log into the system.
3. Set the Alarm Filters.
4. Configure the SYS port along with the ethernet port if desired.
5. Configure the Voice ports.
6. Configure the Data ports.
7. Configure the WAN ports.
8. Configure all other ports.

2.2.3 Choosing a Location for Your System

The IMACS-200 requires a reasonably dust-free, static-free operating environment. Adequate ventilation is also required at the site. Do not install the chassis in direct sunlight, which may increase the system's operating temperature and affect its operation.

Most of the system plug-in ports have highly sensitive components that could be damaged by static electricity. Whenever you handle any system ports, be sure to observe local electrostatic discharge (ESD) precautions.

The system chassis can be installed on an 19-inch or 23-inch equipment rack, or placed on a tabletop or other level surface. First though, make sure the desired surface can support the weight of a chassis.

Be sure to locate the system near all external equipment to which you will connect it. Cable lengths and physical/electrical characteristics are critical to system operation, especially for data signal interfaces. Generally, higher data rates require shorter cables than lower data rates.

Also, you must use T1-grade cables for all system connections to those networks. For best results, use the cables supplied by your supplier when connecting your system to the associated external facilities. For more information on system cabling, call your supplier.

2.2.3.1 Rack Installation Tips

When installing the chassis in a rack, allow at least 2 inches (5.1 cm) of space between the chassis and the equipment in front and behind it for proper ventilation. Use the mounting brackets and attachment hardware furnished with the chassis for this purpose, as outlined in this chapter. If you use other mounting hardware, you may damage the chassis or circuit boards installed in it.

Also route all cables to their destinations through conduits to enhance electromagnetic compatibility (EMC) performance and facilitate future system troubleshooting. When routing cables, be sure not to obstruct any chassis vents.

2.2.3.2 Tabletop Installation Tips

The chassis can be placed on a flat, smooth surface (e.g., a table) that is free of contaminants. This surface should be capable of supporting the chassis.

If you are placing the chassis on a tabletop or other flat surface, be sure to leave enough clearance for air circulation through the system. Make sure the chassis is accessible from both the front and rear.

2.2.4 Installing the Chassis

Figure 2-1 shows the front panel of the IMACS-200 chassis. To mount the chassis in a rack, first attach the brackets to the sides of the chassis, using the four associated 10-32 x 1/4” screws. The brackets are reversible for mounting in 19-inch or 23-inch racks (48.2 or 58.4 cm). For a 19-inch rack, attach the long sides of the brackets to the chassis (Figure 2-2 shows the mounting brackets and holes). For a 23-inch rack, attach the short sides of the brackets to the chassis. You can attach the brackets to either position on the side of the chassis. See Figure 2-3 on page 2-5 for a view of the side panel of the IMACS-200.Then, use the four 12-24 x 1/4” screws to mount the bracketed chassis on the rack.

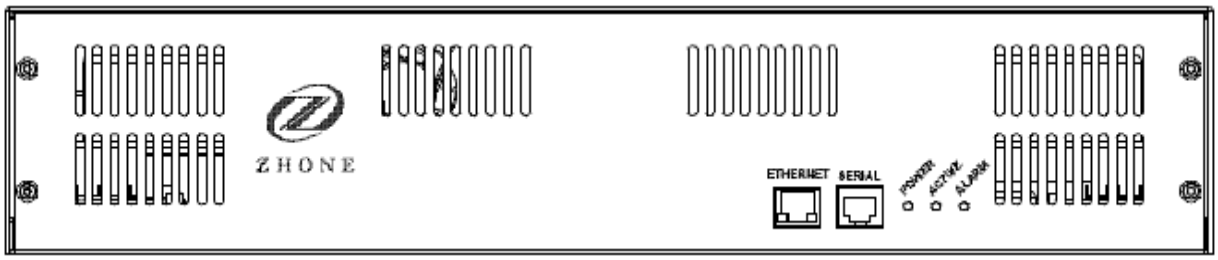


Figure 2-1.IMACS-200 Front Panel

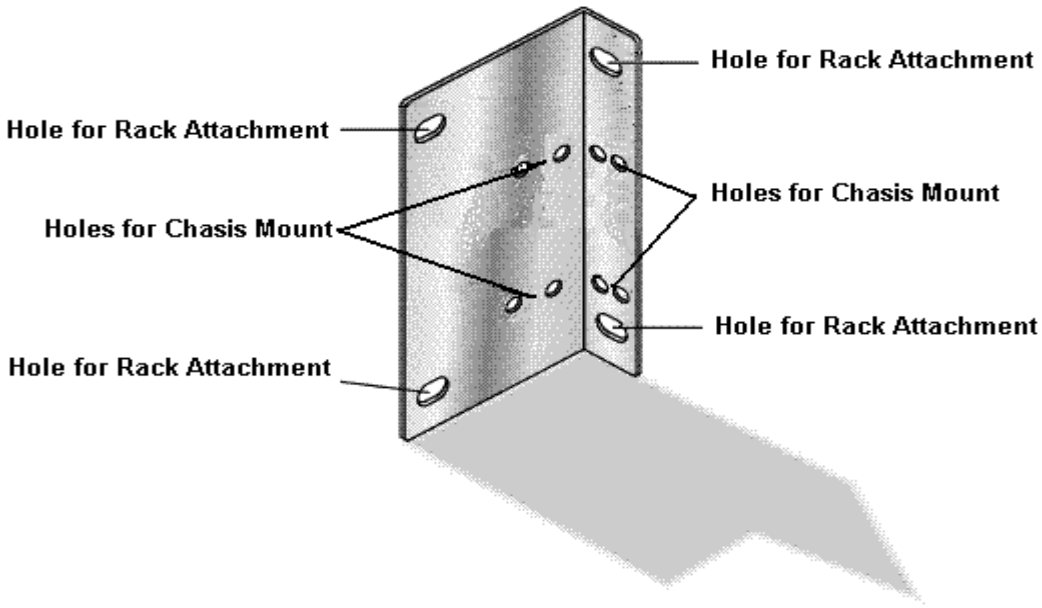

Hole for Rack Attachment
Hole for Rack Attachment
Holes for Chasis Mount
Holes for Chasis Mount
Hole for Rack Attachment
Hole for Rack Attachment

Figure 2-2.Mounting Bracket Holes

The chassis have eleven holes on each side, as shown in Figure 2-3. Eight of these holes facilitate mounting in a 19- or 23-inch rack (48.2 or 58.4 cm). You can attach the front, or middle of this chassis to a rack, using the mounting brackets as previously shown.

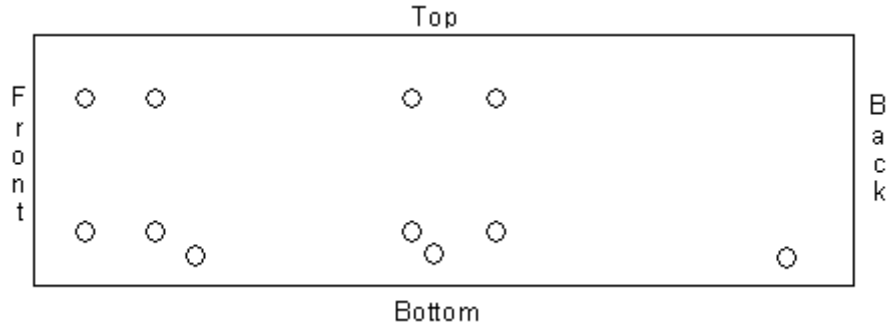


Figure 2-3.Chassis Mounting Holes

Table 2-1 outlines the minimum clearance that is recommended for the IMACS-200 on all four sides.

Table 2-1. Minimum Chassis Clearances

Clearance	Front	Rear
Inches	10	10
Centimeters	25	25

2.3 Connector Types

The product is equipped with several types of electrical connections to the network and power sources. Table 2-2 lists the connections on the front panel of the IMACS-200 (Refer to Figure 2-1 on page 2-4 for an illustration of the IMACS-200 front panel). These connections are available for the crafts person to gain easy access into the unit. Table 2-3 lists the back panel connectors along with their functionality. (Refer to Figure 2-4 on page 2-5 for an illustration of the IMACS-200 back panel)

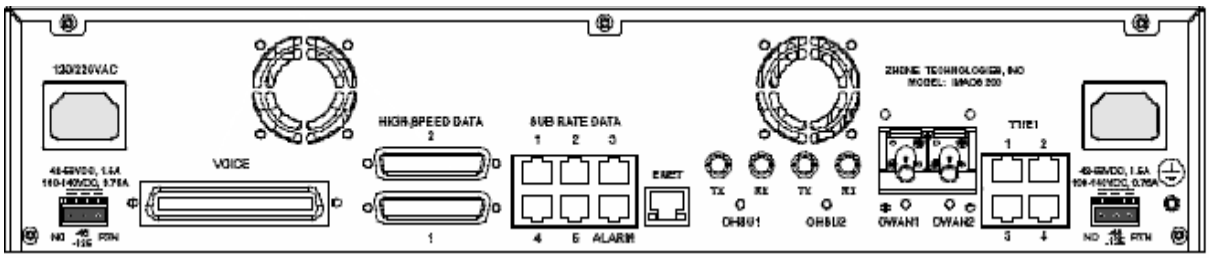


Figure 2-4. IMACS-200 Rear Panel

Table 2-2. Front panel connectors

Connector Name	Connector Type	Description
Ethernet	RJ45	Ethernet port for remote management over IP.
Serial	RJ45	Asynchronous craft port for local management.

Table 2-3. Back panel connectors

Connector Name	Connector Type	Description
Voice	50 pin amphenol	Four E&M lines, transmit only (to) in the introductory offering of the IMACS-200. Each line utilizes eight leads from the connector.
Voice	50 pin amphenol	Four FXS Tip-and-Ring pairs. Each line utilizes two leads from the connector.
Voice	50 pin amphenol	Alarm input contacts are provided in this connector. There are four available contacts, each utilizing two leads from the connector.
Alarm	RJ45	Alarm outputs to an external alarm system.
High Speed Data	DB25 female	Two V.35 high speed data port connectors.
Sub Rate Data	RJ45	Five subrate data (SRU) ports
OHSU1 and OHSU2	Two ST optical connector pairs	The IMACs-200 can be configured with an Optical High Speed Unit with two pairs of optical connections.
Enet	RJ45	Ethernet port for remote management over IP. This port is disabled for this initial release of the product.
T1/E1	RJ45	Four transmit and receive pairs for T1 network access. E1 will be provided in a later release.
48VDC (+-G) 1.5A Max 125VDC (label)	3 position (plugs included with kit of parts)	For DC power inputs. IMACS-200 can have two DC inputs.The cables used to connect the power to the chassis should be 20 to 18 gauge solid wire.
120/220VAC	AC receptacles	Power input 1.0A 50/60Hz when external AC voltage is used to power the unit.The IMACS-200 can have two such supplies.
OWAN1 OWAN2	Not provided	This is for future use.
	Earth Ground	Permanent Earth Ground Connection. Use 14 gauge solid wire for a single connection to the provided earth ground screw. (Note: FXS GND must be connected to earth ground regardless of powering method used.)

2.4 Connector Pin-outs

Following is a description of the various connectors and their respective pin-outs.

2.4.1 High Speed Data port connector pinouts

Table 2-4 describes the signals and pins for the V.35 data ports. The pin assignments are associated with the use of Zhone cable part number 1216M (F).

Table 2-4. V.35 DB25 female connector

Pin	Signal	Source	V.35 (with PRM-1261F cable)
1	Shield		A
2	Transmit Data A	DTE	P
3	Receive Data A	DCE	R
4	Request to Send	DTE	C
5	Clear to Send	DCE	D
6	Data Set Ready	DCE	E
7	Ground		B
8	Receive Line Signal Detector	DCE	F
9	Receive Timing A	DCE	X
10	External Transmit Clock B		
11	Terminal Timing B	Not Used	
12	Transmit Timing A	DCE	AA
13	Not Connected		
14	Transmit Data B	DTE	S
15	Transmit Timing B	DCE	Y
16	Receive Data B	DCE	T
17	Receive Timing B	DCE	V
18	Not Connected		
19	Not Connected		
20	Data Terminal Ready	DTE	H
21	Remote Loopback	DTE	N
22	Local Loopback	DTE	J

Table 2-4. V.35 DB25 female connector

Pin	Signal	Source	V.35 (with PRM-1261F cable)
23	External Transmit Clock A		
24	Terminal Timing A	Not Used	U
25	Test Mode	DCE	NN

Note: For purposes of connection and function, the IMACS-200 should be considered a DCE.

2.4.2 E&M, FXS and Alarm input connector

Table 2-5 lists the connector pinouts for the E&M circuits, FXS circuit and the provided alarm input points. For E&M, “R”, “T” and “M” are consider input direction, “R1”, “T1” and “E” are considered output direction, and “SB” and “SG” are considered direction-neutral.

Table 2-5. 25-pair female amphenol connector

Port	Designation	Pin	Port	Designation	Pin
E&M Port 1	T-1	26	E&M Port 4	T-4	38
E&M Port1	R-1	1	E&M Port4	R-4	13
E&M Port 1	T1-1	27	E&M Port 4	T1-4	39
E&M Port 1	R1-1	2	E&M Port 4	R1-4	14
E&M Port 1	E-1	28	E&M Port 4	E-4	40
E&M Port 1	M-1	3	E&M Port 4	M-4	15
E&M Port 1	SG-1	29	E&M Port 4	SG-4	41
E&M Port 1	SB-1	4	E&M Port 4	SB-4	16
E&M Port 2	T-2	30	FXS Port 1	T-1	42
E&M Port 2	R-2	5	FXS Port 1	R-1	17

Table 2-5. 25-pair female amphenol connector

Port	Designation	Pin	Port	Designation	Pin
E&M Port 2	T1-2	31	FXS Port 2	T-2	43
E&M Port 2	R1-2	6	FXS Port 2	R-2	18
E&M Port 2	E-2	32	FXS Port 3	T-3	44
E&M Port 2	M-2	7	FXS Port 3	R-3	19
E&M Port 2	SG-2	33	FXS Port 4	T-4	45
E&M Port 2	SB-2	8	FXS Port 4	R-4	20
E&M Port 3	T-3	34	ALM 1A	Alarm contact	46
E&M Port 3	R-3	9	ATM 1B	Alarm contact	21
E&M Port 3	T1-3	35	ALM 2A	Alarm contact	47
E&M Port 3	R1-3	10	ALM 2B	Alarm contact	22
E&M Port 3	E-3	36	ALM 3A	Alarm contact	48
E&M Port 3	M-3	11	ALM 3B	Alarm contact	23
E&M Port 3	SG-3	37	ALM 4A	Alarm contact	49
E&M Port 3	SB-3	12	ALM 4B	Alarm contact	24
			NC	Not Used	50
			NC	Not Used	25

2.4.3 T1 interface RJ45 connector

Table 2-6 lists the T1 RJ45 connector pinouts.

Table 2-6. T1 connector pinouts

RJ-45(F) Pin	Signal
1	R1
2	T1
4	R
5	T
3, 6, 7, 8	Not assigned

2.4.4 Ethernet connections

Table 2-7 lists the RJ45 connector pinouts for the ethernet ports on the front and rear of the chassis.

Table 2-7. Ethernet connector pinouts

RJ-45(F) Pin	Signal
1	TXP
2	TXN
3	RXP
4	TXCT
5	RXCT
6	RXN
7	Not used
8	Ground

2.4.5 Sub Rate Data Ports

Table 2-8 lists the RJ45 connector pinouts for the five sub rate data ports on the rear of the chassis.

Table 2-8. Sub Rate Data (SRU) ports connector pinouts

RJ-45(F) Pin	Signal	Direction
1	SCT	Output
2	RLSD	Output
3	SCR	Output
4	Ground	
5	RXD	Output

Table 2-8. Sub Rate Data (SRU) ports connector pinouts

RJ-45(F) Pin	Signal	Direction
6	TXD	Input
7	CTS	Output
8	RTS	Input

2.4.6 Alarm Output Connector

The IMACS-200 is equipped with an RJ45 connection on the rear faceplate labelled **ALARM** to drive external alarm responders such as buzzers, bells, and lights. Table 2-9 indicates the pin-outs for this RJ45 connector.the T1 RJ45 connector pinouts.

Table 2-9. Alarm Output Connector pinouts

RJ-45(F) Pin	Signal
1	Alarm Output 1C
2	Alarm Output 1
3	Alarm Output 2C
4	Alarm Output 2
5	Alarm Output 3C
6	Alarm Output 3
7	Alarm Output 4C
8	Alarm Output 4

2.4.7 Serial port - Craft Interface

The IMACS-200 is equipped with an RJ45 connection on the front faceplate labelled **SERIAL** to allow crafts person access to the IMACS-200 at all times.

Table 2-10. Serial port interface connector pinouts

RJ-45(F) Pin	Signal
4	Ground
5	Receive
6	Transmit
1,2,3,7,8	Not used

2.4.8 Connecting Cables to the ports

Connect system ports to the external equipment, using the proper cables. The ports have various types of connectors for those connections.

Voice ports have a 50-pin Amphenol-type jack. To connect a cable to this type of jack, first plug the male connector of the cable into the jack and push it in all the way. Then, tighten the mounting screws on either end of the cable connector shroud to the IMACS-200 connector.

For modular (RJ-45) jacks, push the cable's mating plug into the jack until it snaps into place. However, do not try to force the plug into the jack.

For DB-25 jacks, first plug the cable's mating connector firmly into the jack. Then, thread the screws on either side of the cable connector shroud into the standoffs on either side of the port jacks, and hand-tighten them.

For a list of available cables for the IMACS-200, refer to Table 1 in the Product Description section in the front of this user guide.

2.5 Power and Grounding on the IMACS-200

2.5.1 Power Supply and Ringing Generator

The power supply and ringing generator system can consist of up to two power supplies, and has one on-board ringing generator. The IMACS-200 comes with the proper power supplies factory-assembled depending on the ordering information provided at the time of purchase. Following is more detailed information regarding the power inputs.

2.5.2 System Power (Redundancy)

The IMACS-200 provides power redundancy for any of the powering options. The supplies are factory-installed, and the external connectors to receive the powering options selected will be pre-installed on the unit. Figure 2-4 on page 2-5 high-lites the location of the Power Supply feeds.The 120VAC and 220VAC power inputs are lightly shaded, and the -48VDC and -125VDC options are darkly shaded.

2.5.3 AC Power Supply and DC Power Supply Fuses

The AC power supply and DC Power Supply fuses are already built in to the supplies. These fuses are not field serviceable. When unpacking the unit, an AC power cord will be in the box for each of the AC power supplies ordered. The AC inlet connector is located in the rear corners of the chassis. For a single supplied unit, the rear right-hand connector will be equipped. Refer to the system specifications section in this manual for input power requirements.

2.5.4 System Power and Ground Connections

After installing the system, make the power and ground connections to the chassis as described in this section. A frame ground connection is provided in the right-rear corner of the IMACS-200 rear panel.

2.5.5 Grounding requirements

Due to the UL regulatory requirements, a mounting stud is required for connection of the AC input earth ground lead to the product chassis. The ground lead must be connected to the chassis using a No. 6 screw, which is included. When grounding the system, use 14 gauge solid wire for a single connection to the provided earth ground screw. The mounting location is labeled with the IEC 417 No. 5019 symbol to identify this as the AC earth ground connection point. This mounting stud is located next to the IEC 320 AC input connector.

2.5.6 Chassis with Power Supplies

Figure 2-4 on page 2-5 shows the different power connections on the chassis.

For DC powered systems, the lower right and lower left-hand connections provide for separate, redundant power feeds to the system's pre-installed DC power supplies if so equipped. These two sets of leads provide a connection for separate, redundant power feeds to the system in a load-sharing mode.

The telecommunications voice signaling ground is a referenced ground connection to the -48VDC power system. Both feeds are referenced to the same place within the IMACS-200. This reference ground can occur at the -48VDC power source. **If the ground connection is not maintained, and one side of the connection equipment is not referenced to an earth ground then a floating ground condition can occur causing the voice circuits and the voice signaling to react erratically when either end of the connecting equipment tries to start the circuit.**

Sites using only loop start telecommunication circuits (no ground start or E&M signaling) can operate properly without the Telecom Signaling Ground.

When grounding the system, use 14 gauge solid wire for a single connection to the provided earth ground screw.

For AC powered systems, the right and left-hand connections provide for separate, redundant power feeds to the system's pre-installed AC power supplies if so equipped. These two sets of leads provide a connection for separate, redundant power feeds to the system in a load-sharing mode.

2.5.7 DC power installation

When wiring to an external power source, such as a battery rack, fuse panel, or circuit breaker, make sure that the correct rating of wire is used. Figure 2-5 illustrates the DC power plug. It is recommended that you use 20 to 18 gauge solid wire.

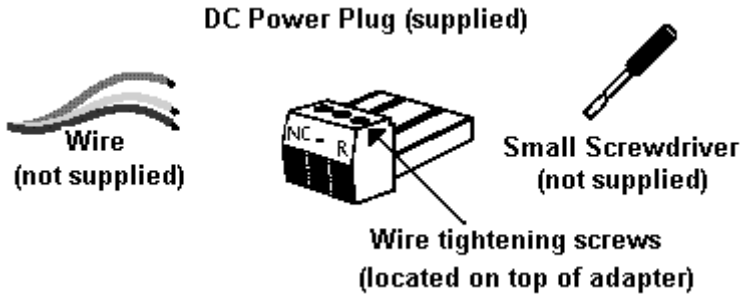


Figure 2-5. DC Power plug

When the IMACS-200 is ordered with a single-power supply unit, the IMACS-200 will come with the power supply installed on the right-hand rear of the box, closest to the T1/E1 ports and grounding screw. Insert the power plug illustrated above into this right-hand rear connector.

2.5.8 AC power installation

If ordered as an AC unit, the IMACS-200 will come pre-assembled with one or two AC connectors on the rear panel, as illustrated in Figure 2-4 on page 2-5. To apply the AC source to the unit, simply use the supplied AC cords included in the packaging to connect the IMACS-200 to the 120VAC or 220VAC source.

2.5.9 Powering Up the System

After connecting the chassis to the external power sources and making the proper ground connections, apply power to the chassis. Plug the AC power cord into the associated electrical outlets, or turn on the external DC power supply. Then, observe the following front-panel LEDs:

1. On start-up, all LEDs on the front and rear of the unit cycle through the following color sequence:

   Orange, Green, Red and blank.

2. The **POWER** LED then will turn green on the chassis faceplate. The **ACTIVE** LED will stay orange until the unit boot cycle is completed, and then turn green.

If no LEDs illuminate, verify that the external power source is providing power to the chassis, and check the connection between that source and the chassis.

Once power is confirmed, the user interface should appear. If not, simply hit carriage return. A window like Figure 2-6 should appear. Type in the user name of “admin”, and the password is “admin”.

Figure 2-6. IMACS-200 Initial Login Screen

Chapter 3
System Configuration and Operation

3.1 Basic Operations

This chapter provides instructions for configuring the IMACS-200 for operation after installing it at the equipment site.

Before performing the procedures in this chapter:

1. Be sure your IMACS-200 is installed and powered up.

2. Determine your system's specific configuration requirements. These depend on your network and customer premises equipment (CPE) interfaces. If this configuration information already exists, obtain it from your system administrator or engineers.

3. Obtain a terminal with VT-100 or VT-102 emulation and an RS-232 to RJ45 serial cable for these procedures. The terminal will be connected directly to the SERIAL port on the front faceplate of your system. This will allow you to access the system and then configure it for operation with your network and CPE.

Refer the Table 2-10 on page 2-11 for pinouts for RS-232 and SERIAL port.

3.2 Basic Screen Map and Legend

To make system access, configuration and testing easy, the system presents you with a series of user interface screens. Each screen displays various fields of information, and you can change the data in those fields as required by your system and external interfaces.

3.3 System Power-up

The IMACS-200 system will initialize when it is powered up. The normal sequence for initialization and login are described on the following pages.

3.3.1 System Boot

Following the application of power, proceed as follows:

1. Be sure your system and local terminal are both powered up.

2. Connect a VT100-compatible terminal to the SERIAL jack on the faceplate of the IMACS-200 front panel. Use a cable with an RJ-45 modular plug on one end for this connection.

3. Configure the terminal to operate at 9.6 kbps, 8 data bits, no parity, and 1 stop bit.

Should your SERIAL cable be connected prior to powering the IMACS-200, or should power be removed and re-applied to the IMACs-200 during this process, the following screen will appear:

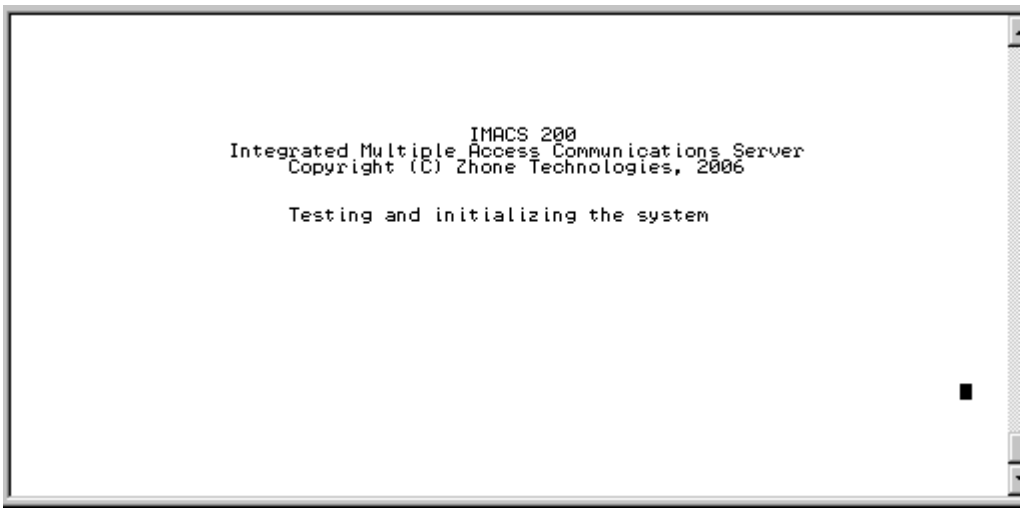

IMACS 200
Integrated Multiple Access Communications Server
Copyright (C) Zhone Technologies, 2006
Testing and initializing the system

Figure 3-1.Testing and Initialization Screen

4. Press the RETURN key. The Login Screen appears.

The system will display Figure 3-1 above. When testing and initializing is complete the screen will go blank. Press the <Enter> key. The System Login Screen will display, as seen in Figure 3-2

3.3.2 Logging Into the System

The first step in starting a user session is to log into the system. You must enter a password that allows you to perform the required tasks on the system. For access levels and user permissions, refer to the section detailing user access in Section 4.3.2 on page 3 of Chapter 4 *IMACS-200 General Features*.

To log into the system from a local terminal, proceed as follows. To log in from a remote PC refer to details later in this reference manual.

1. Press <Enter>. The Login Screen depicted in Figure 3-2 on page 3-3 should appear. If not, press <Enter> again until it does.

2. If the Login Screen does not appear after you press <Enter> several times, check your terminal settings (they should be 9.6 kbps, eight data bits, no parity, and one stop bit).

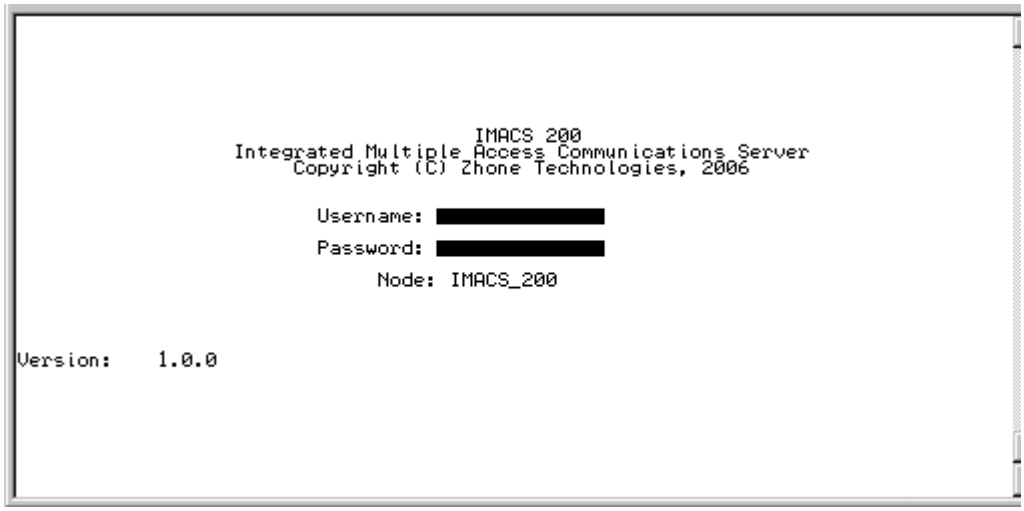


Figure 3-2.Typical Login Screen

3. Contact your system administrator for your Username and Password. Enter your Username, and press either the <enter> or <tab> key. Then enter your Password and press RETURN to accept the password, which will allow you to configure your system after logging in for the very first time. Refer to the next section for descriptions of the various user levels.

4. Should you be the system administrator, the default Username is **admin** and the password is **admin**. As this constitutes a Superuser access, it is highly recommended that this default password be changed to prevent unauthorized access and enhance the security of the IMACS-200.

5. The System Main Screen appears. Figure 3-3 shows this screen.

Figure 3-3.Typical System Main Screen

This completes the login process. If you are not familiar with the user interface screens of the system, read the next section before proceeding. Otherwise, continue with the desired operation.

3.4 System Screens

The system screen will display each port that is currently installed onto the system along with the port status and location.

3.4.1 System Main Screen

After you log in, a System Main Screen Figure 3-5 appears, showing all of the ports currently in the system. The port types and current port operational states also appear in this screen.

The highlighted line at the bottom of the screen lists some actions. Press the letter key that corresponds to the desired action you want to perform. For example, to go to the Alarms Screen (**Alarms** action) and see the current system alarms, press "**a**" (**can be typed in either uppercase or lowercase**). Table 3-1 summarizes the System Main Screen actions.

Table 3-1. System Main Screen Actions

Action	Function
Alarms	Brings up the Alarm Screen. Refer to "Alarms and Alarm Filters" later in this chapter.
Xcon	Brings up the cross-connect screens.
sYstem	Brings up the system screen for high-level system testing and maintenance.
Logout	Logs you off the system.
Oos	Allows authorized operators restart the unit.

3.4.2 Voice and Data Port Status

The System Main Screen also displays the status of the individual circuit ports of all WAN, Voice and Dataports in the system. This information appears next to the port type, as shown in Figure 3-4. The lowercase letters in the Status column fields indicate the states of the individual port ports. The possible values for each port are **s** (Standby), **a** (Active), **t** (Test), and **l** (currently in a Loopback state).

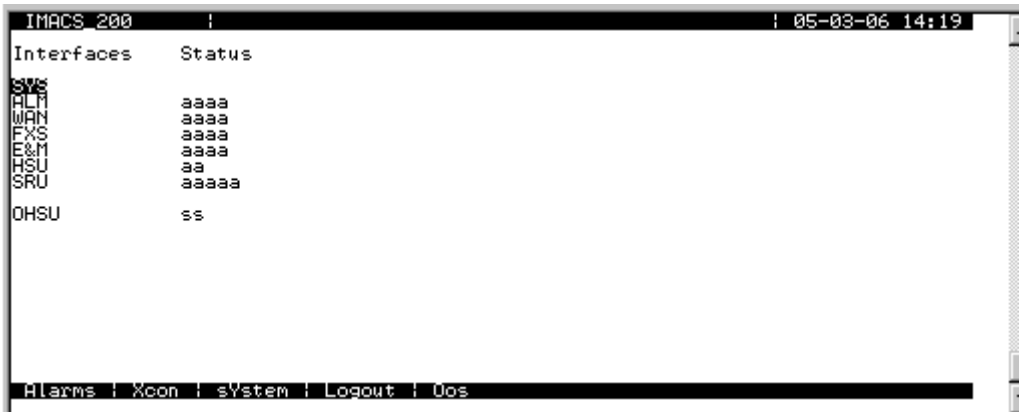


Figure 3-4.Typical port Status Display

From the System Main Screen, you can also access other screens, as shown in Figure 3-4. These screens are described in the following paragraphs.

3.4.3 Service Type Main Screens

Each port type in the system has a port Main Screen associated with it. You can go from the System Main Screen to any port Main Screen and configure that device. From a port Main Screen, you can access a Test Screen to perform tests on the port, or (in some cases) a Performance Monitor Screen to view transmission performance data.

Figure 3-5 shows a typical port Main Screen. The highlighted line at the top of every screen is the header. It lists the node name of the system, the current port type and abbreviated description, the port design revision and serial number, and the current system date and time.

The port configuration parameters and current option settings appear in numerous rows and columns below the header. This region of each screen lists the options on the left and one or more associated columns of data fields from left to right. You can change the settings in those fields as required for each port.

The status and data entry change line appears just above the bottom line of the screen. When you choose a field to edit and press <Enter>, this line shows the currently available option settings for that field. Make all configuration changes on this line.

The highlighted area in the upper right corner shows the current alarm status data. In Figure 3-5 below, a yellow alarm has occurred on WAN port 4, and a Loss of Signal alarm has been detected on WAN port 3.

Figure 3-5.Typical port Main Screen

The bottom line of each port Main Screen lists other actions you can perform by simply pressing the letter key that corresponds to the uppercase letter of your desired action. In Figure 3-5, for example, if you press "**s**", you will invoke the **Save** command, which saves the current option settings in the system's memory. The actions you can choose from this line depend on which port and screen you are currently accessing. Refer to the associated chapters in this guide for descriptions of those actions.

3.4.4 Test and Debug Screen

You can also go from the System Main Screen to a Test and Debug Screen, which allows you to perform system-level maintenance operations. You can back up the system configuration onto an external computer after saving and subsequently editing it, and (if necessary) you can restore that configuration to the system. You also can erase the system configuration and restart the system with a single “zip” command.

The system software also has a built-in debugging utility. However, this utility is only available to factory software engineers. The system maintenance functions are described in the “Testing and Debugging” section later in this chapter.

3.5 Port Configuration

3.5.1 Selecting and Configuring Your ports

The System Main Screen lists all system ports. You can access any port from the Main Screen by moving the cursor in the installed interfaces column with the arrow keys until the desired port is highlighted, then press <Enter>. The associated port Main Screen now appears. The only optional installed interface on the IMACS-200 is the Optical High Speed Data Unit (OHSU).

Use the arrow keys to move the cursor around in any port screen. When changing port parameters, some settings require you to enter your own values on the keyboard, while others allow you to select from a list of pre-programmed option settings.

To enter a user-defined value in a field, first highlight that field by moving the cursor to it and press <Enter>. Then, type the desired value on your keyboard and press <Enter> to store it in that field.

To choose an option setting from a list of displayed options, press <Enter> with the associated parameter field highlighted. A series of available option settings now appears for that field. Use the right-arrow and left-arrow keys to move the cursor to the desired setting, and press <Enter> to store that setting in the highlighted field.

Be sure to configure each port according to your networking requirements. From the System Main Screen, select each port in turn and change the options for that port from its Main Screen. Select the **Save** command by pressing “**s**” after making all the changes for a port, then press “**m**” to return to the System Main Screen and choose another port. Similarly configure each remaining port in your system.

Once configured, the port settings are permanently stored in Non-Volatile Random Access Memory (NVRAM).

3.5.2 Recording Your Configuration Settings

You should always record the configuration option settings for each port after you set them. This information may be needed later for system operation. To record the port configuration data, first photocopy the pages showing the port Screens in the associated chapters of this guide. Then, mark the option settings you want to use on those pages, and store the pages in a safe place where they can be readily obtained.

You can also record screen settings by “capturing” each edited screen onto your computer terminal while you are logged into the system. To do this, your computer must have a software program capable of capturing the actual screens as text files. The communications software you use to access the system may have this ability. You can then copy the screens to a word processing program, print them out, and / or store them electronically.

3.6 Reinitializing the System

The system stores information about its currently installed ports, the port configuration option settings, WAN connections, passwords, and other data in nonvolatile memory (NVRAM). When you change any settings on the port types, the NVRAM remembers the previous port settings.

Restart capability is available on the IMACs-200. If the user desires to restart the IMACS-200, capability is available on the main login screen with the Oos command. This command will restart the box, as shown in Figure 3-6. preserving all provisioned data.

Figure 3-6.Rebooting the IMACS-200

If you have redeployed the IMACS-200, or otherwise desire to re-initialize the unit to the default settings, you can “zip” it, causing it to be reprogrammed. From the main login screen, enter ‘Y’ to go to sYstem. A screen such as what is seen in Figure 3-7 appears

.

Figure 3-7.System Screen - Test and Debug.

Once here, enter ‘Z’ to zip the system, and the screen seen in Figure 3-8 will appear.

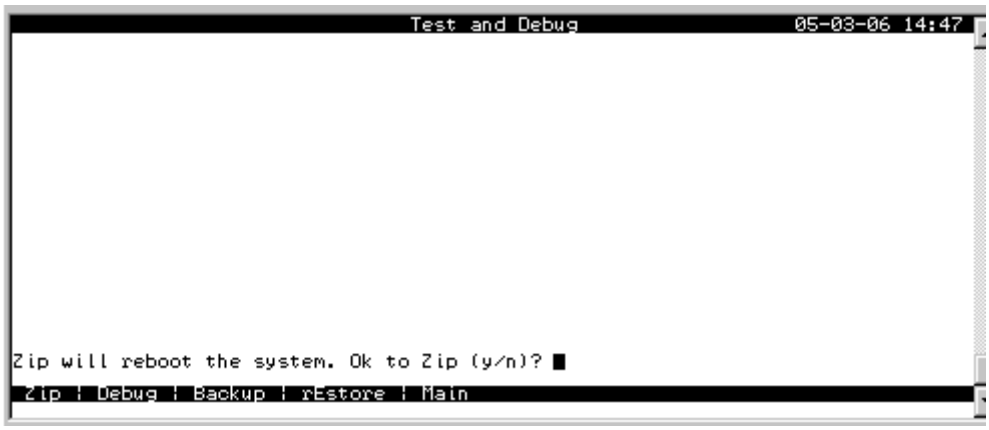


Figure 3-8.Cold-Start NVRAM “Zip”Test and Debug Screen.

WARNING!

Confirming the "Z" command will start the ZIP process. "Zipping" the system deletes all of the information stored on NVRAM and resets it. All ports must then be completely reconfigured.

When you press “**z**”, the system will ask, "OK to Zip the system (y/n)"? Press “**y**” to have the system test and re initialize itself. All NVRAM information will be erased from the IMACS-200, and a new log-in screen will appear.

3.7 Alarms

Alarms warn you of problems by reporting possible system hardware or external facility failures. The Alarm screen is accessed from the System Main Screen by pressing the "**A**" key to go to the Alarm Screen (see Figure 3-9 through Figure 3-11). The Alarm Screen displays the currently active alarms (if any) and provides access to the Alarm Filters and Alarm History screens. Figure 3-9 shows a typical Alarm Screen with an active alarm.

3.7.1 Alarm Screens

Refer to Figure 3-9. To view the current system alarms, you can go from the System Main Screen to an Alarm Screen. From the Alarm Screen, you can then go to an Alarm Filters Screen and set up the alarm reporting filters. Or, you can access an Alarm History Screen (log) and view alarms that were previously logged by the system. These screens and operations are discussed in the “Alarms and Alarm Filters” section later in this chapter.

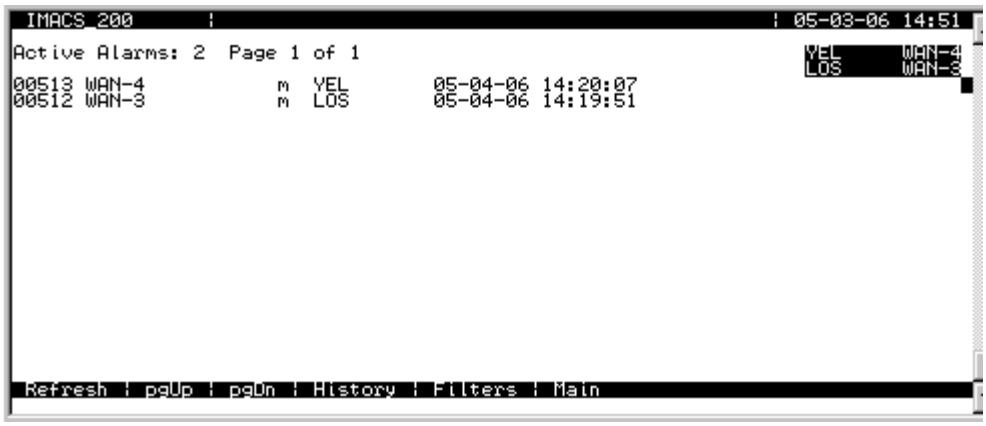

IMACS 200 | 05-03-06 14:51
Active Alarms: 2 Page 1 of 1
YEL WAN-4
LOS WAN-3
00513 WAN-4 m YEL 05-04-06 14:20:07
00512 WAN-3 m LOS 05-04-06 14:19:51
Refresh | pgUp | pgDn | History | Filters | Main

Figure 3-9.Typical Alarm Screen

The first character set (**00513** in the above display) is the Alarm Sequence Number. This is a sequential number from **1** to **65,535**. It identifies the alarm for tracking and maintenance. In the above example, the Alarm Sequence Number is **513**.

The second character set (**WAN-4**) is the location of the problem. In this case, the WAN port WAN-4 is affected and has reported the alarm.

The third character set is the alarm modifier (in this case, **m** indicates a minor alarm). See the “Alarms and Alarm Filters” section later in this chapter for more information about alarm modifiers.

The fourth character set (**YEL**) is the type of alarm generated (in this case, a Yellow alarm on WAN port WAN-4).

The last two character sets are the date and time the alarm was logged.

3.7.2 Alarm Filter Settings

You can set filters for each alarm so that the alarm reports occurrences in a number of different ways. Figure 3-10 shows the Alarm Filters screen, which is accessed by pressing "**f**" (**Filters** command) on the Alarm Screen.

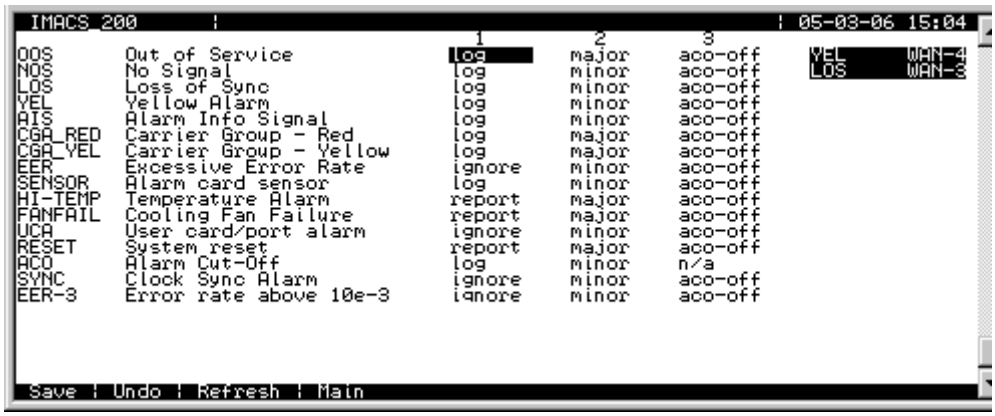

IMACS_200 : : 05-03-06 15:04
1 2 3
OOS Out of Service log major aco-off
NOS No Signal log minor aco-off
LOS Loss of Sync log minor aco-off
YEL Yellow Alarm log minor aco-off
AIS Alarm Info Signal log minor aco-off
CGA_RED Carrier Group - Red log major aco-off
CGA_YEL Carrier Group - Yellow log major aco-off
EER Excessive Error Rate ignore minor aco-off
SENSOR Alarm card sensor log minor aco-off
HI-TEMP Temperature Alarm report major aco-off
FANFAIL Cooling Fan Failure report major aco-off
UCA User card/port alarm ignore minor aco-off
RESET System reset report major aco-off
ACO Alarm Cut-Off log minor n/a
SYNC Clock Sync Alarm ignore minor aco-off
EER-3 Error rate above 10e-3 ignore minor aco-off
YEL WAN-4
LOS WAN-3
Save : Undo : Refresh : Main

Figure 3-10.Alarm Filters Screen

The first column of the Alarm Filters Screen is the alarm abbreviation that appears when an alarm is generated. The second column is the associated full name of each alarm. Table 3-2 describes each alarm appearing in the Alarm Filters Screen.

The third column contains the filters **ignore**, **log**, and **report**. Set the filter to **ignore** if you want the system to ignore the alarm. Or, set it to **log** if you want the system to show the alarm report on the screen and also log it into the Alarm History, as described later in this chapter.

Set the filter to **report** if you want the system to send (report) the alarm indication to a remote device. With this setting, the system will also display the alarm report on the screen and log it into the Alarm History.

The fourth column of the Alarm Filters Screen contains the filter modifiers **info**, **minor**, **major**, and **crit**. This column specifies a level of importance (information only, minor alarm, major alarm, or critical alarm) for each alarm. These settings are described later in this chapter.

The last column sets the alarm cutoff (ACO) to **aco-off** or **aco-on**. These settings are explained later in this chapter.

The filter in the third column takes precedence over its modifier. If, for instance, you have an alarm filter set to **ignore**, the setting of the modifier as **info**, **minor**, **major,** or **crit** will be ignored. Refer to system specifications section in this manual for alarms and their meanings.

Table 3-2. Alarm Filters

Filter	Alarm	Meaning
NOS	No Signal	Incoming WAN signal is lost.
LOS	Loss of Synchronization	Frame Alignment is lost.
YEL	Yellow Alarm	The system has received a Yellow Alarm signal from a remote device. Usually received when the device loses WAN signal or synchronization.
AIS	Alarm Information Signal	The system has received a Blue Alarm signal from a remote device. Usually received when the remote or intermediate device has a major failure.
CGA_RED	Carrier Group Alarm - Red	The local incoming WAN signal has a serious problem and trunk conditioning is started. After receiving a RED alarm (NOS or LOS) for 2-3 seconds, the system initiates the appropriate trunk conditioning sequence (see voice ports for information about the TC_CGA setting) and sends a Yellow Alarm to the remote device. If the system is in drop/insert mode, it also sends an AIS signal to the downstream equipment.
CGA_YEL	Carrier Group Alarm - Yellow	The system has initiated trunk conditioning in response to a Yellow Alarm from a remote device. After 2-3 seconds, the system initiates the appropriate trunk conditioning sequence (see voice ports for information about the TC_CGA setting).
ERR	Excessive Error Rate	The error rate measured by the system has exceeded the threshold set on the WAN port.
SENSOR	Alarm port Sensor	The Alarm port sensor has received an alarm indication from an attached device.
HI-TEMP	Temperature Alarm	The IMACS-200 has exceeded it's ability to regulate the temperature in the unit, and external action is required.
FANFAIL	Cooling Fan Failure	One of the two supplied fans has failed.
UCA	User port/port alarm	One or more active ports on a user port are not working properly. Voice ports will show an alarm for excessive signaling transitions and data ports will show an alarm for exceeding the data error threshold.
RESET	System reset	The system has been reset by either loss of power or by a system software upgrade.
ACO	Alarm Cut-Off	The ACO option forces you to manually clear certain alarms. Without this option, self-correcting alarms might not be noticed. When the ACO option is set to either Report or Log and the modifier is set to Major, alarms will report normally but will also generate an ACO alarm. If the modifier is set to Minor, it will not generate the ACO alarm. If the filter is set to **I**gnore, no alarms will be generated. This can depend on whether or not the IMACS-200 is set for **latch** or **cur**.
SYNC	Clock Sync Alarm	The SYNC alarm is generated when either the primary or secondary external clock source is lost. This alarm is in addition to the condition that lost the clock source (CGA-RED or OOS).

3.7.3 Alarm Modifiers

Each alarm may also be designated as **I=info**, **m=minor**, **M=major** or **C=crit**. The filter modifier appears on both the active alarm and alarm history screens.

If the system has an External Alarm port (optional), the occurrence of any alarm designated as **crit** will trigger a form-C relay contact on the External Alarm port. The relay contact action sets off an annunciator or lamp at the equipment site. Similarly, the occurrence of any alarm designated as **major** triggers a different contact and activates another external indicator. Refer to the Alarm port Reference Guide for more information on the External Alarm ports.

3.7.4 Alarm Cutoff (ACO)

The ACO (Alarm Cutoff) security feature is used by the system to alert an operator to alarms that clear themselves while the system is unattended. The ACO option settings are **aco-on** and **aco-off**. If ACO is set to report or log alarms, any alarm set to report or log with a major modifier brings up an additional alarm message on the screen. You must manually clear this message, which is the ACO alarm message (depends on whether or not IMACS-200 is set for latch or CUR). The ACO is used with the node port of the Interface port. It can also trigger an external alarm device, such as a bell or lamp, that must also be manually cleared.

All ACO alarms must be cleared from the Interface port screen. ACO alarms can be cleared automatically or manually.

3.7.5 Alarm Handling

Alarms set to either **log** or **report** record occurrences automatically to the Alarm History Screen. To view that screen, press **"h"** (**History** command) in the Alarm Screen. Figure 3-11 shows a typical Alarm History Screen, in which you can update the log with any new alarms that occur. To do this, press "**r**" to select **Refresh** in the Alarm History Screen. Or, to delete all entries in the log, press "**c**" to select **Clear** in the Alarm History Screen.

The alarm log may contain more than one screen (page) of data. To scroll through the log, press "**u**" or "**d**" (**pgUp** or **pgDn**) to move up one page or down one page at a time. The latest alarms appear at the beginning of the log, which is on the first page of the alarm log.

All alarms (except those set to **ignore**) appear in the Alarms field in the upper right corner of the screen, regardless of their setting in the Alarm Filters screen. The display in the Alarms field is an abbreviated version of the alarm name and location number. For example, CGA_RED below indicates that WAN port 2 has had a Major red alarm.

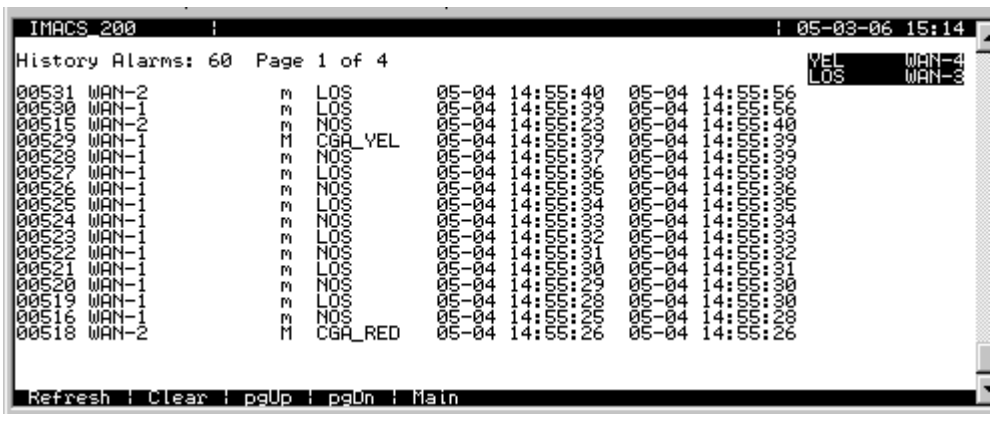


Figure 3-11.Typical Alarm History Screen

3.8 Cross-Connecting (XCON)

From the System Main Screen, you can access a Cross-Connect Screen by pressing "**x**" (**Xcon**) that lets you cross-connect WAN time slots between T1 links. Refer to the Cross-Connecting WAN Time Slots section later in this manual.

3.9 System Level Maintenance

You can also go from the System Main Screen to a Test and Debug Screen, by pressing "**y**" (**sYstem**) which allows you to perform system-level maintenance operations. You can back up the system configuration onto an external computer after saving and subsequently editing it, and (if necessary) you can restore that configuration to the system (*refer to the backup and restore section later in this chapter*). You also can erase the system configuration and restart the system with a single "zip" command.

3.9.1 Test, Debug, Backup & Restore

Advanced configuration and diagnostics are available through the use of the **sYs** (**sYstem**) command from the System Main Screen. Pressing "**y"** brings up the Test and Debug screen shown in Figure 3-12.

Figure 3-12.System Test and Debug Screen

3.9.2 Debugging the System

The **D** (Debug) command is only available to factory personnel with a password authorization higher than "Superuser." It gives access to the system software coding.

3.9.3 Backing up the System Configuration Data

The IMACS-200 provides the capability to backup the system configuration to a PC or network service device. This information will be contained in a file, and can be used to restore the data to the same unit should it ever need to be re-installed, or to use the configuration as a base file to place into other boxes with the same configuration to save time on installation.

There are two options for backup and restore, as seen in figure Figure 3-13. TFTP and xmodem file transfer protocols are employed on the box.

Figure 3-13.Backup (and restore) File Transfer Protocols

3.9.4 Pre-TFTP Backup and Restore Preparation

To perform backup and restore uploads/downloads via the TFTP function, the following method of connection to a Local Area Network (LAN) network must first be selected.

1. The first option requires that the system to which you will download be powered and running through an active ethernet port that is connected to a LAN. The connection must be made either in the box that will receive the downloaded or in a remote box routed through the local IMACS-200 that is set as a gateway using IP protocol. You must be able to ping the IMACS-200 IP address from the PC or server that you intend to use as a TFTP server and vice versa. Setting up the host IP address, netmask and gateway are done at the sYstem level, and then editing the parameters in the tcp/Ip screen as shown in figure Figure 3-14 on page 3-18. The Host IP State must be set to the active status, and the Host

I P and netmask parameters must be set. You may need to change the routing table on your PC to include the IMACS-200 ethernet address as the gateway, or the local host address as the gateway for the system receiving the file as the destination IP address,

IMACS_200 ¦ SYS ¦ 05-04-06 10:05
1
HOST IP STATE stdby
HOST IP ADDR 0.0.0.0
HOST NETMASK 0.0.0.0
HOST TYPE host
DEFAULT IP TYPE local ethernet
DEFAULT IP SLOT n/a
DEFAULT IP TS n/a
DEFAULT GATEWAY 0.0.0.0
Ping ¦ Netstat ¦ Save ¦ Undo ¦ Refresh ¦ Main

Figure 3-14.Setting the Host IP address

Note: *Your PC must have some sort of TFTP or TFTPD server software installed and running when you are downloading the binary files to the system. If you are using TFTPD type software it is easier if you set the root directory to indicate where the binary file is located at the TFTPD root screen. This eliminates the need to enter a path at the file name screen during the download process. If you are running a TFTP software package, consult the user guide accompanying the software for details on configuring and using the software.*

3.9.5 TFTP Backup for 1.x.x

Follow the instructions listed below to perform a TFTP backup.

1. Log into the Integrated Access System using the Manager Password.
2. Press **"Y"** for **System** at the main menu.
3. At the Test and Debug screen press **"B"** for **Backup.**
4. The NV Ram Backup screen will appear. If the Protocol selected is xmodem, press **Enter**. You will be shown the option of tftp on the bottom of the screen. Use the right or left arrow key to move to tftp, and press **Enter**.
5. Press **"G" for Go** - an NV image overwrite command confirmation appears. Enter **"Y"** for yes.

6. Confirmation appears when the NV Ram flash backup is complete. Press **Enter** as prompted on the screen.

7. TFTP backup is now ready to proceed. Select TFTP by highlighting the appropriate protocol using the arrow keys. Press **Enter** when *TFTP* is highlighted.

8. Press **"G"** for **Go.**

9. A series of four questions must be answered to complete the backup process. The questions are as follows:

   The system asks for the desired number of mismatch retries. Enter an appropriate number between 1-40, with 20 as default. Press **Enter**.

   The system asks for the desired number of Timeout Retries. Enter an appropriate number between 1-10, with 4 as default. Press **Enter**.

   Next, the system requires the IP address of the PC or TFTP server to which the backup will be sent. Following entry of the IP address press the **Return** key to continue.

   Finally, the system requires entry of the filename for the backup being performed. Following entry of a filename the backup process begins. A *TFTP backup complete* message appears when the process finishes.

   Finally, the system requires entry of the filename for the backup being performed. Following entry of a filename the backup process begins. A *TFTP backup complete* message appears when the process finishes.

3.9.6 TFTP Restore for 1.x.x

Follow the instructions listed below to perform a TFTP restore.

1. At the main menu press **"Y"** for **System**.

2. Press **"E"** for **Restore** at the Test and Debug menu.

3. Use the arrow keys to highlight the Protocol selection and press **Enter**.

4. Select **TFTP** and press **Enter**.

5. You will receive an NV Ram image overwrite confirmation message. Press **"Y"** for **yes**.

6. Enter the desired number of Mismatch retries and press **Enter**.

7. Enter the desired number of Timeout Retries and press **Enter**.

8. Enter the IP address of the PC or TFTP server and press **Enter**.

9. Enter the filename for the backup you wish to restore and press **Enter**. Restoration begins.

10. Following completion of the restoration process, the system will prompt to restore data with the image that was uploaded. Press **"Y"** for **yes**.

11. The system asks to reboot. Press **"Y"** for **yes**. The system reboots and configuration becomes active.

3.9.7 XMODEM Backup

Follow the steps listed below to perform an XMODEM backup.

1. Log into the Integrated Access System on which the backup is to be performed.

2. Press **"Y"** for **System** at the main menu.

3. When the Test and Debug screen appears, press **"B"** for **Backup.**

4. If the selection currently indicates TFTP, then press **Enter.**

5. Select **xmodem** using the arrow keys and press **Enter**.

6. Press **"G"** for **Go**. A confirmation appears upon completion of the NV Ram backup to flash. Press **Enter** as prompted on the screen.

7. Prior to starting the backup or restore process, ensure that have the PC emulation package is set to the XMODEM type format, otherwise an error will occur during the process. XMODEM backup is now ready to proceed.

8. From the terminal screen select **"Receive File"** from the appropriate file menu. The system prompts for a backup storage directory and filename. Following entry of the appropriate information, backup begins. With most terminal emulation software (i.e., Hyperterminal, ProCom, or Smartcom) a status window will appear during the backup process.

9. A system backup completion message appears and the system then prompts you to press **Enter** to continue. The backup is now complete.

3.9.8 XMODEM Restore

Follow the steps listed below to perform an XMODEM restore.

1. Log into the Integrated Access System to be restored.

2. To restore a previous backup access the main menu. Press **"Y"** for **System**.

3. Press **“E”** for **Restore** at the Test and Debug screen.
4. If the selected *Protocol* indicates TFTP, then press **Enter**.
5. Select XMODEM transfer method and press **Enter.**
6. Press “**G”** for **Go** to begin restore**.**
7. From the terminal emulation window select **“Send File”.** Enter the correct location and filename of the backup to be restored and press **Enter.** Restoration should begin and a progress monitor screen will appear.
8. Upon completion of the restoration, the system prompts whether or not to restore the NV Ram image, select **“Y”** for **Yes.**
9. The system prompts whether or not to reboot. Select **“Y”** for Y**es.**
10. Following system reboot, login as usual and proceed as appropriate.

3.10 Time Slot Assignment

This section provides instructions for assigning DS0 time slots to the voice and data ports of the IMACS-200. It also provides time slot cross-connection setup instructions.

The IMACS-200 maximizes the use of incoming and outgoing T1 lines. You can do this by assigning specific channels, or *DS0 time slots*, to voice and data ports in the system. You also can cross-connect time slots between T1WAN ports of the system.

The WAN port allows you to connect one DS0 time slot to another. Throughout this chapter, these connections are called "pass-through" circuits because they link a time slot from one T1 line to another through the system. You can therefore have up to four separate T1 links on two WAN ports, in any cross-connect combination.

The following sections of this chapter describe several ways for you to administer your networks and correctly allocate transmission bandwidth to meet your needs. The next section deals with assigning time slots to the user voice and data port.

The third section deals with cross-connecting WAN time slots to other WAN time slots.

The fifth section describes signaling status, signaling, and companding conversion. The last section shows you how to view the time slot map after making your assignments and cross-connections.

This chapter defines "assigning time slots" as the process of connecting user port ports to WAN ports and time slots, and it defines "cross-connecting time slots” as the process of connecting WAN time slots to other WAN time slots in the system.

3.10.1 Modes of Operation

In the 1.x.0 system, the only mode available is *XCON*.

3.10.1.1 XCON Mode (XCON)

The XCON mode allows the user to cross-connect DS0s to user voice or data ports or to cross-connect any DS0 on any WAN port to any DS0 on any other WAN port in the system. The “Mode” setting on a WAN in a XCON system will only indicate the XCON option.

3.11 Assigning Time Slots

You must use a *time slot map* to specify the connections between all incoming and outgoing lines connected to the system. The time slot map lets you split up your T1 bandwidth into portions required for normal voice and data communications. It contains the connections for all ports in your system.

3.11.1 Assigning a Time Slot to a User port Port

You can define a time slot map from any user port (data or voice) for connections involving that port, or from a WAN port for cross-connections involving only WAN ports. For example, Figure 3-15 shows the E&M port Main Screen for the time slot assignments. Assign time slots to a voice port as follows:

1. From the System Main Screen, select the desired voice port and press <Enter>. That port’s Main Screen appears.

2. Select the WAN port from which you want to assign time slots to the E&M port. In Figure 3-15, this is **W1-1** (for WAN 1, port 1).

3. Select a time slot (TS) for the first port. A number appears at the bottom of the screen for the corresponding time slot on the WAN port.

4. Set the time slot number by using the up and down arrow keys to highlight it, then press the <Enter> key.

5. Change the STATE of the port from **stdby** to **actv**.

6. Repeat steps 2 through 5 for the remaining port ports, to assign time slots to them.

7. Press “**s**” to save your settings, using the **Save** command in the port Main Screen.

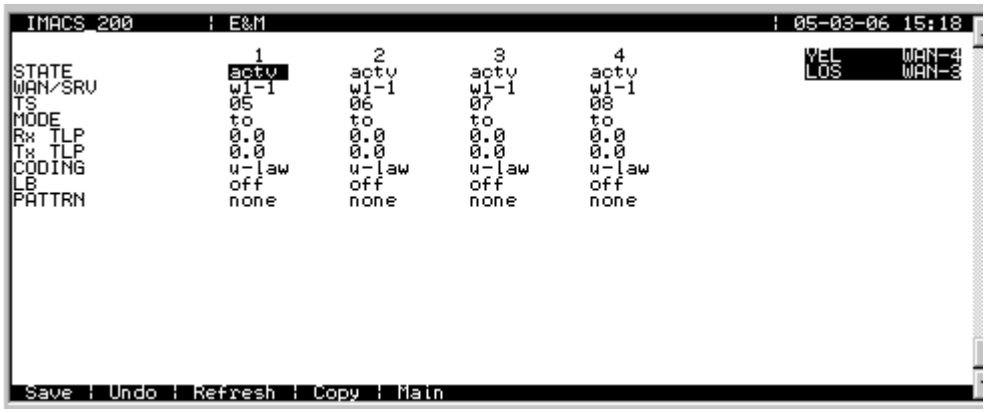

IMACS_200 ¦ E&M ¦ 05-03-06 15:18
1 2 3 4
STATE actv actv actv actv
WAN/SRV w1-1 w1-1 w1-1 w1-1
TS 05 06 07 08
MODE to to to to
Rx TLP 0.0 0.0 0.0 0.0
Tx TLP 0.0 0.0 0.0 0.0
CODING u-law u-law u-law u-law
LB off off off off
PATTRN none none none none
YEL WAN-4
LOS WAN-3
Save ¦ Undo ¦ Refresh ¦ Copy ¦ Main

Figure 3-15.Typical E&M port Time Slot Assignments

3.11.2 Cross-Connect Model

The Cross-connect model allows you to access one T1 links for each of two WAN ports, for a total of four T1 links. All WAN port connections to other WAN ports are accomplished through the cross-connect option on the System Main Screen, and must be individually specified.

3.12 Circuit Names

A cross-connect circuit in the IMACS-200 is formed when assigning one resource to another using one or more time timeslots. Resources are User, Server and WAN ports.

When a resource is formed when assigning a user or server port to a WAN, a circuit is formed and given a name according to the type of circuit and type of resources assigned Table 3-3 lists the default circuit name assignments.

Table 3-3. Circuit Names

user_circuit	user port (FXS, to WAN)
net_circuit	WAN port to WAN port
usr_circuit	DS0 port to WAN port

Note: *Not all circuits formed in the IMACS-200 system have a direct relationship with a slot and unit. These types of circuits are not maintained by the CNA. Circuits made manually from the Cross Connect screen are not be affected by other resources. Examples of this type of circuit are WAN-to-WAN and user circuits.*

3.12.1 Display and Change Circuit Names

Circuits can be displayed on the Cross Connect screen by pressing the "x" key from the main screen as shown below.

IMACS_200 | SYS | 05-03-06 15:21
page: 1 of 1
YEL WAN-4
LOS WAN-3
CIRCUIT ID W/U TS/BW W/U TS/BW
net_circuit w1-2 01*64 w1-3 01*64
Add | uPdate | dElete | pgUp | pgDn | View all | Main

Figure 3-16.Cross Connect Screen

Circuits are then selected by moving the arrow keys up and down. Only network type circuits are shown on the first Cross Connect screen.

To display a list of all cross connects in the IMACS-200 system from the Cross Connect screen, select "View All". Below is a sample of this screen.Note that this is page one of two. Using the ‘d’ for pageDown and ‘u’ for pageUp will display more pages.The rename circuit screens following will be on page 2 of 2.

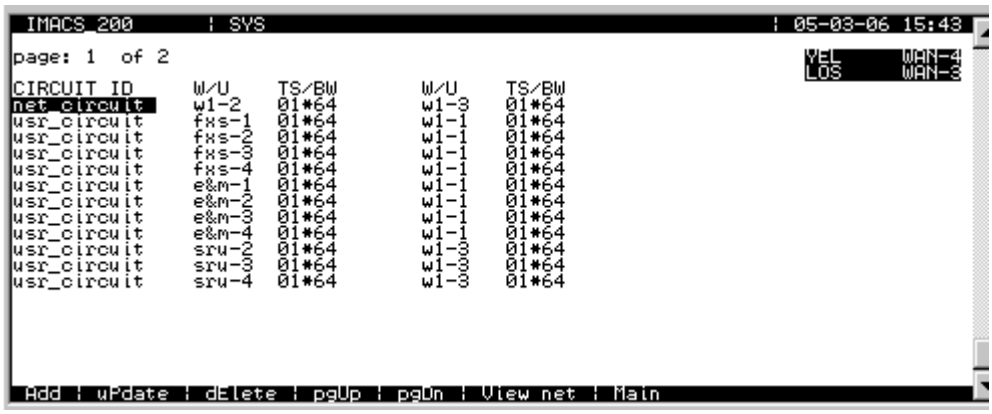

IMACS_200 | SYS | 05-03-06 15:43
page: 1 of 2
YEL WAN-4
LOS WAN-3
CIRCUIT ID W/U TS/BW W/U TS/BW
net_circuit w1-2 01*64 w1-3 01*64
usr_circuit fxs-1 01*64 w1-1 01*64
usr_circuit fxs-2 01*64 w1-1 01*64
usr_circuit fxs-3 01*64 w1-1 01*64
usr_circuit fxs-4 01*64 w1-1 01*64
usr_circuit e&m-1 01*64 w1-1 01*64
usr_circuit e&m-2 01*64 w1-1 01*64
usr_circuit e&m-3 01*64 w1-1 01*64
usr_circuit e&m-4 01*64 w1-1 01*64
usr_circuit sru-2 01*64 w1-3 01*64
usr_circuit sru-3 01*64 w1-3 01*64
usr_circuit sru-4 01*64 w1-3 01*64
Add | uPdate | dElete | pgUp | pgDn | View net | Main

Figure 3-17.Cross Connect Screen -View All

Renaming Circuits

For the renaming feature, it does not matter which side of the circuit is selected, only the line at which the original circuit is printed matters.

After hitting the 'n' key on the View All screen, circuits can be rename by hitting 'Enter' as shown in the following figure.

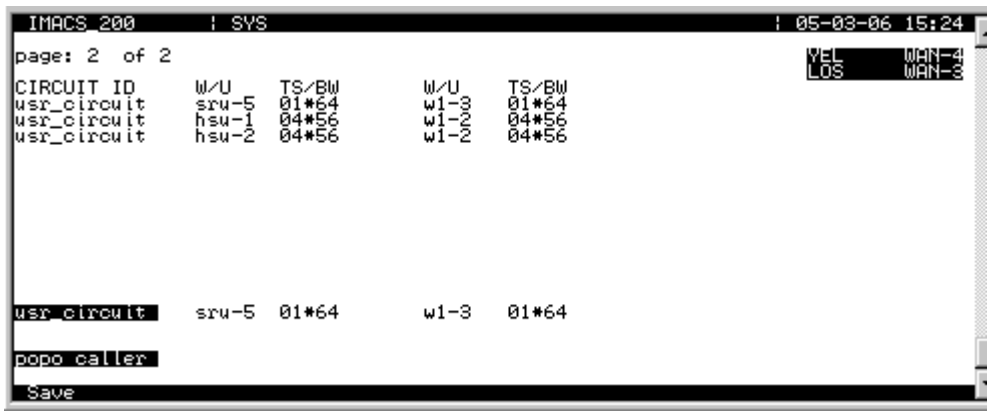


Figure 3-18.Cross Connect Circuit (Rename)

Hitting "S" to save the circuit name changes the name of the circuit as shown in the below figure:

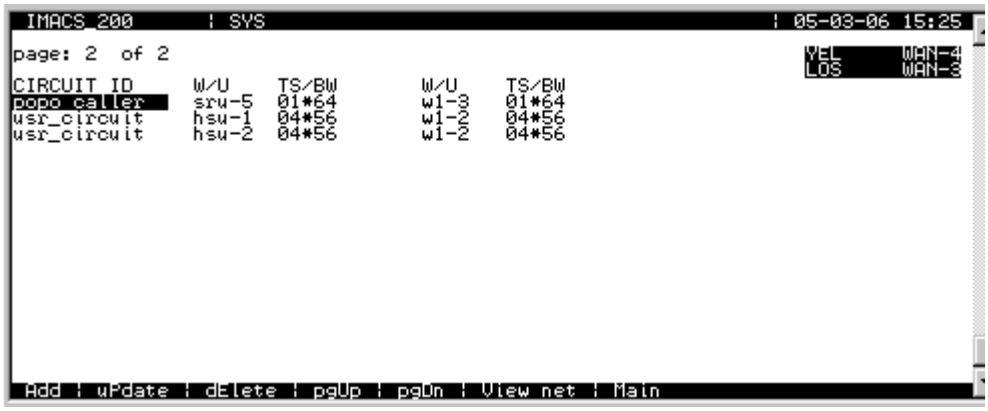

IMACS_200 ¦ SYS ¦ 05-03-06 15:25
page: 2 of 2
VEL WAN-4
LOS WAN-3
CIRCUIT ID W/U TS/BW W/U TS/BW
popo caller sru-5 01*64 w1-3 01*64
usr_circuit hsu-1 04*56 w1-2 04*56
usr_circuit hsu-2 04*56 w1-2 04*56
Add ¦ uPdate ¦ dElete ¦ pgUp ¦ pgDn ¦ View net ¦ Main

Figure 3-19.Cross Connect Rename Circuit (Saving)

3.12.2 Backup and Restore Circuit Name Table

The circuit name table can be backed up and restored via VNVRAM, adding additional flexibility for managing circuit names.

When TFTP is used or NVRAM is backed up to FLASH, entire NVRAM is saved, including the circuit name table.

Figure 3-20.NVRAM Backup Screen

When NVRAM is restored via TFTP or from FLASH, the entire image is transferred including the circuit name table. The circuit name table shown as Xcon Names has been added to the selections to allow ascii restore as shown in the figure below.

Figure 3-21.NVRAM Restore Screen

Upon restoring the Xcon Names table, changed circuit names will be restored into NVRAM for recognition whenever the resource using it is next changed.

To change a circuit name permanently using NBR, change the circuit name in both the Xcon Names and the Xcon Names selections. Changing the names in the Xcon table alone will only preserve the name until next time the resource holding it is changed.

3.13 Cross-Connecting WAN Time Slots

After assigning the user ports to DS0 time slots, you can also assign the remaining WAN time slots for pass-through cross-connections betweenT1 links.

You can cross-connect WAN time slots from the System Main Screen. To perform cross-connections, press "**x**" in that screen to invoke the **Xcon** command. The Cross-Connect Screen in Figure 3-22 appears. In the cross-connect screen, type "**a**" to add a cross-connect circuit. The **Add** command provides the fields used to program all of the "pass-through" circuits in the network (See Figure 3-23). Table 3-4 lists the circuit parameters and their options and default settings.

IMACS_200 ¦ SYS ¦ 05-03-06 15:21
page: 1 of 1
YEL WAN-4
LOS WAN-3
CIRCUIT ID W/U TS/BW W/U TS/BW
net_circuit w1-2 01*64 w1-3 01*64
Add ¦ uPdate ¦ dElete ¦ pgUp ¦ pgDn ¦ View all ¦ Main

Figure 3-22.Cross-Connect Screen

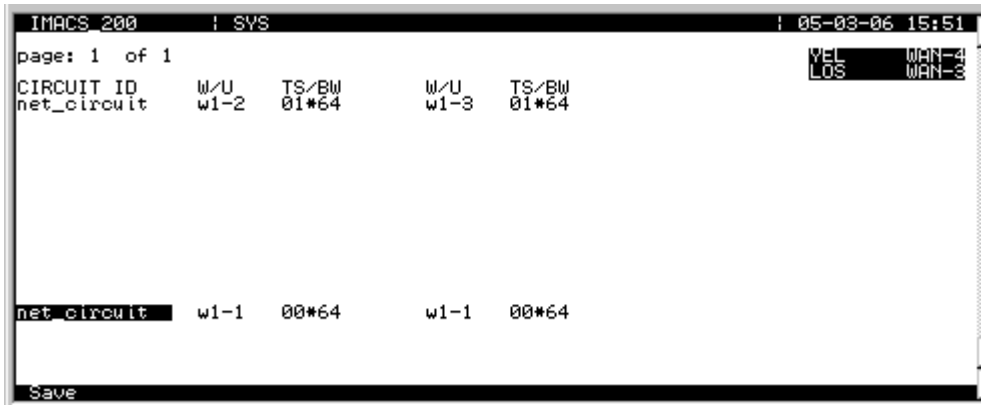


Figure 3-23.Add a Cross-Connect Circuit Screen

Table 3-4. Time Slot Cross-Connection Options and Defaults

Parameter	User Options	Default
CIRCUIT ID	Any combination of letters or numbers up to 14 characters, including spaces	**********
W/U	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	w1-1
TS/BW	table	00
W/U	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	w1-1
TS/BW	table	00

CIRCUIT ID

A *circuit* is defined as a group of one or more DS0 time slots cross-connected from one WAN link to another. Each circuit can carry either voice or data traffic, and needs its own name to facilitate cross-connect management within the system. The Circuit ID field allows you to name individual pass-through circuits. The factory-default ID is "new circuit.” However, you can change the ID to show any relevant title for the pass-through connection, although each circuit ID must be unique. This ID can contain up to 14 numbers, letters (uppercase and lowercase), and spaces, in any combination. Figure 3-24 shows an example of a new circuit, which is named **SF01-NY01**.

WARNING!

When cross-connecting multiple independent data DS0 time slots (sequentially grouped time slots should work) for data. Super-rate [data type cross-connect] is multiple DS0s sequentially assigned between WAN aggregates in a cross-connect system. DO NOT attempt to save time by cross-connecting independent data time slots as one super-rate circuit (could cause data errors.) This limitation does not apply to voice time slots.

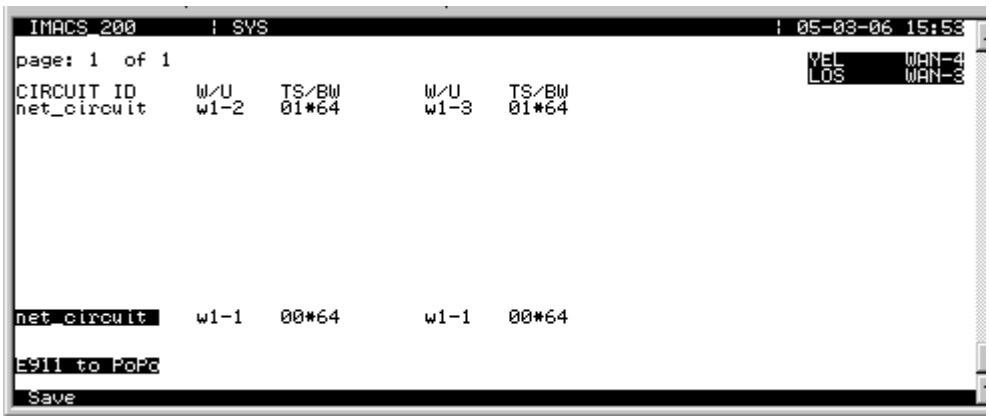


Figure 3-24.New Circuit Selection and ID Assignment

W/U

The first WAN Unit (W/U) column is the T1 link in which the pass-through connection begins (since these circuits are bi-directional, the concept of beginning or ending is used for illustrative purposes only). The options are all WAN ports and ports, and the identification uses the same convention (**w1-1, w1-2, etc**.) seen earlier. If a WAN port is not present in the W/U selected, an error message is generated.

The example in Figure 3-25 shows **w1-1** (WAN 1, port 1) as the selected WAN port and port.

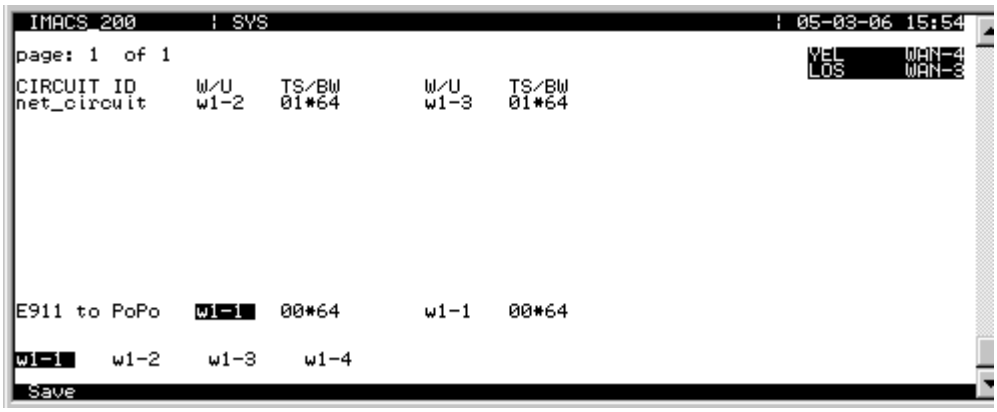

IMACS_200 : SYS : 05-03-06 15:54
page: 1 of 1
VEL WAN-4
LOS WAN-3
CIRCUIT ID W/U TS/BW W/U TS/BW
net_circuit w1-2 01*64 w1-3 01*64
E911 to PoPo w1-1 00*64 w1-1 00*64
w1-1 w1-2 w1-3 w1-4
Save

Figure 3-25.WAN Unit Options

TS/BW

The first Time Slot/Bandwidth column shows the different time slots of **w1-1** that will be assigned to this pass-through connection. Figure 3-26 shows the selection of time slots 8 to time slot 12 of **w1-1** assigned to the start of the connection. Any number of time slots from **1** to **24** is allowed for T1 transmission.

Make your selection by using the space bar and arrow keys. The arrow key moves from slot to slot, and the space bar toggles between selecting and deselecting a time slot.

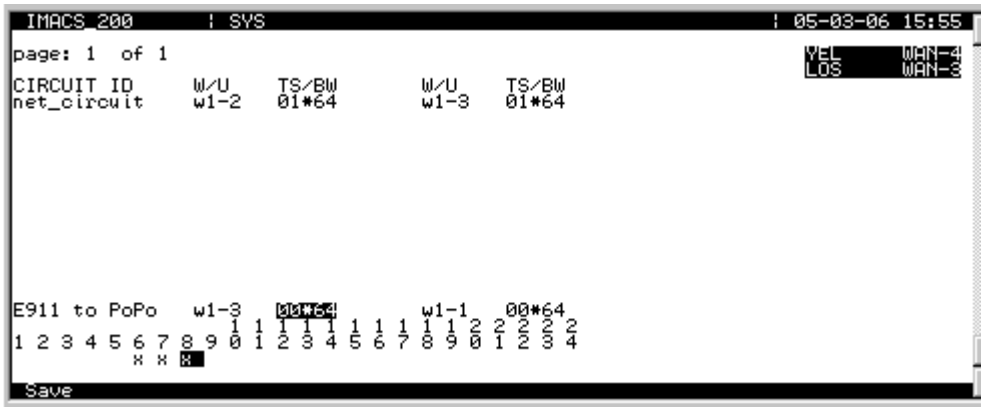


Figure 3-26.Time Slot and Bandwidth Options

W/U

The second WAN Unit column is the T1 link in which the pass-through connection ends. The options are all of the WAN ports and ports. If a WAN port is not present in the W/U selected, an error message is generated. Figure 3-25 shows the selection of W 1-3.

TS/BW

The second Time Slot/Band Width column shows the different time slots from WAN 1-3 that will be assigned to this pass-through connection. Figure 3-26 shows the selection of 5 time slots from WAN 1-3 assigned to the end of the connection. Any number of time slots from **1-24** would be accepted for T1 operation. The bandwidth is automatically assigned.

Make your selection with the space bar and arrow keys. The arrow key moves from slot to slot, and the space bar toggles between selecting and deselecting the time slot. *The number of DS0 time slots assigned to this half of the cross-connect circuit must equal the number assigned to the other. Otherwise, the system will reject the connections and generate an error message*.

Users dealing with a voice cross-connect circuit (with or without signaling) can access capabilities from the WAN cross-connect screen. See the review at the end of this section.

3.14 Cross-Connect Actions

Figure 3-5 summarizes the actions you can perform from the Cross-Connect Screen. These actions appear at the bottom highlighted line of the screen.

Table 3-5. Cross-Connect Screen Actions

Action	Function
Add	Allows you to program additional pass-through cross-connects in the system. If mistakes are made during the add process, pressing the up arrow or down arrow key will terminate this operation.
uPdate	Initiated by pressing the "**p**" key. With this command, users can change any of the parameters of a pass-through connection. Use the arrow keys to highlight the area to be changed and close the transaction using the "**s**" (Save) command.
dElete	Initiated by pressing the "**e**" key. Use this command to delete existing pass-through connections. The system will prompt users to delete the circuit, and the "**y**" key must be pressed to complete the transaction.
pgUp	Initiated by pressing the "**u**" key. Since the system can handle many different cross-connect circuits, users may exceed a single screen. New pages will be added automatically to accommodate additional circuits. The page count feature at the top of the screen shows the current page and the total amount of cross-connect pages. Use this command to scroll up through the pages of cross-connect information.
pgDn	Initiated by pressing the "**d**" key. This action is similar to the pgUp command. Use this command to scroll down through the pages of cross-connect information.
View all or View net	The View all action is initiated by pressing the "**v**" key. T
Main	Return to the Main IMACS-200 screen.

To update a cross-connected circuit from the Cross-Connect Screen, highlight the circuit name to be updated, and press "**p**" to invoke the **uPdate** command. Figure 3-25 shows the WAN port 1-3 and TS (time slots) 6 through 8 being updated. However if the WANs are selected and deleted as shown in Figure 3-27 then the screen in Figure 3-26 will be blank for WAN TS 6 through 8.

To delete a cross-connected circuit from the Cross-Connect Screen, highlight the circuit name to be deleted, and press "**e**" to invoke the **dElete** command. Figure 3-27 shows the deletion process.

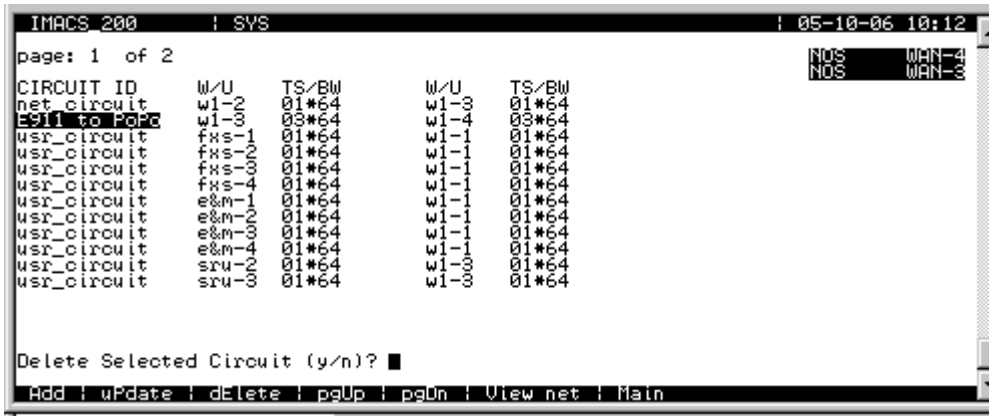

IMACS 200 | SYS | 05-10-06 10:12
page: 1 of 2
NOS WAN-4
NOS WAN-3
CIRCUIT ID W/U TS/BW W/U TS/BW
net_circuit w1-2 01*64 w1-3 01*64
E911 to PoPc w1-3 03*64 w1-4 03*64
usr_circuit fxs-1 01*64 w1-1 01*64
usr_circuit fxs-2 01*64 w1-1 01*64
usr_circuit fxs-3 01*64 w1-1 01*64
usr_circuit fxs-4 01*64 w1-1 01*64
usr_circuit e&m-1 01*64 w1-1 01*64
usr_circuit e&m-2 01*64 w1-1 01*64
usr_circuit e&m-3 01*64 w1-1 01*64
usr_circuit e&m-4 01*64 w1-1 01*64
usr_circuit sru-2 01*64 w1-3 01*64
usr_circuit sru-3 01*64 w1-3 01*64
Delete Selected Circuit (y/n)?
Add | uPdate | dElete | pgUp | pgDn | View net | Main

Figure 3-27.Delete Cross-Connection Screen

3.15 Recording the Time Slot Configuration

After setting up the initial system configuration and define the time slot map, record this information on paper. Recording the initial configuration in a logical manner will help if you have a problem later.

Record the information in a way that makes sense to you and will be easy for others to understand. Also be sure to note the initial settings for each port in copies of the T1 operation tables provided in Table 3-6. Store all initial configuration information in a safe place where anyone needing to service the system can easily find it.

Table 3-6. Time Slot Recording Form for T1 Operation

WAN Port No. _____ - _____

TS Number	port Type	Port Number
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

3.16 Power Supply Redundancy

Each power supply component runs in a load-sharing mode, if your IMACS-200 is so equipped. Should one of the supplies fail, the backup unit will automatically take over all the power needs of the IMACS-200. Also, the defective unit will create a system alarm upon

failure, to alert an operator. Both the AC and DC versions of the IMACS-200 can have backup power feeds and supplies, if so ordered. Upon failure, the ALARM LED on the faceplate of the IMACS-200 will be turned on and a system alarm will be generated.

Chapter 4
IMACS-200 General Features

4.1 Introduction

The SYS level is the highest level of the IMACS-200 and performs most of the configuration, management, and common processing for the system. In addition the SYS level provides the interconnection of WAN/User/Server Pulse Code Modulation (PCM) buses through a bus connect or cross connect function.

4.2 SYS Descriptions

The main SYS level is accessed as soon as a user logs into the IMACS-200. This main screen is seen in figure Figure 4-1.

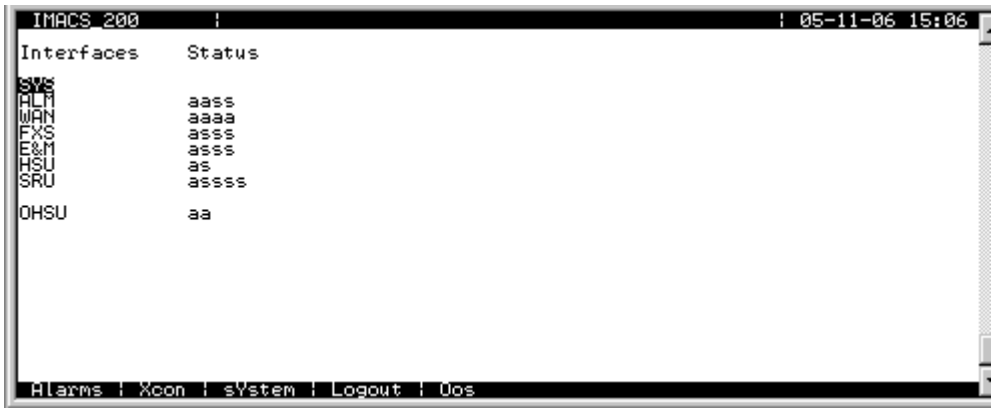


Figure 4-1.Main SYS level upon login

To enter into the SYS level to begin setting up the ethernet port and the other features described in this chapter, simply press enter. The screen in Figure 4-2 will then appear.

4.3 User Screens and Settings

The IMACS-200 main SYS has several user interface screens for port configuration and network status viewing purposes. These screens are described in the remainder of this chapter.

4.3.1 SYS port Main Screen

Figure 4-2 shows the SYS port Main Screen. You must configure the SYS port after logging into the system for the first time. To view this screen, highlight the desired SYS port in the System Main Screen and press <Enter>.

Figure 4-2.SYS port Main Screen

The SYS port has numerous settings that you must configure. The SYS Main Screen displays the status of each SYS port (active or standby), the type of port installed, and the host software version currently installed on that port. The settings are described in the next few sections of this chapter.

The bottom highlighted line of the above screen shows a series of actions you can perform in this menu. To perform an action, press the letter key associated with the uppercase letter of the desired action. For example, to save your port option settings after making them, press "**s**" to invoke the **Save** command. Table 4-1 lists and describes these actions.

Table 4-1. SYS port Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., performance and test data).
tcp/Ip	Allows the user to configure for TCP/IP functionality.
usrNames	Allows additions to user names, groups, password administration.
Clock	Allows the user to set the IMACS-200 timing parameters, time of and date, ACO activity
Main	Returns you to the System Main Screen. If you made changes to any port settings but did not save them yet, you will be prompted to save or lose those changes before exiting.

4.3.2 User Names, Passwords and Groups

You may want to change your system access passwords frequently, in order to maintain optimum security on your network. The recommended passwords are a minimum of 6 and no more than 12 characters in length, are not found in a dictionary, and contain both letters and numbers. Because the system is case-sensitive for password entries, you can mix uppercase and lowercase letters to provide more possible passwords.

Note: *The passwords **MUST** be at least six characters long and must be a combination of characters and at least one digit!*

The system supports 256 possible users. Each user is defined by the use of three entries or fields. The fields are editable by a user who has Administrator or Superuser access. Following is a brief description to the user fields:

Table 4-2. User Access Table

User Name	Password	User Group
An Alpha-numeric string consisting of 1 to 12 characters. Duplicate user names are not allowed, i.e. all 256 user names must be unique.	An Alpha-numeric string consisting of 1 to 12 characters.	A number from 1 to 32.

When the system is first commissioned, there is only one group defined:

Table 4-3. Default User Table

Default User Name	Default Password	Default User Group
admin	admin	1

Each user group represents a different access level that allows a login id to perform system certain tasks after logging in.

4.3.2.1 User Groups

The User Group that is assigned to a user defines the access level that he or she has to various system functions. The following example shows a portion of a user group provisioning table. The system allows for 32 such user groups:

Table 4-4. User Accesses by Group

User Group Number	WAN Provisioning	WAN Alarms	WAN PMs	Access Provisioning	Access Alarms	Access PMs	Administer System	Administer Users
1 (Superuser)	RW	RW	RW	RW	RW	RW	RW	RW
2	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW
3	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW
4	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW
n	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW
n	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW
32	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW	N or R or RW

When the system is first commissioned, or after a ZIP function, the user group defaults to the following configuration:

Table 4-5. Default Group Permissions

User Group Number	WAN Provisioning	WAN Alarms	WAN PMs	Access Provisioning	Access Alarms	Access PMs	Administer System	Administer Users
1	RW	RW	RW	RW	RW	RW	RW	RW
2 - 32	R	R	R	R	R	R	R	R

User group 1 is the "Superuser" and its attributes are not provisionable. User groups 2 to 32 default to R in all attributes. They can have any one of 3 possible values entered into the various cells of the user group table:

N = None. When "N" is entered in a section of the user group definition, users with that group have no access to that part of the system, including its UI

R = Read Only. When “R” is entered in a section of the user group definition, users with that group have read (or view) access to that part of the system, including its UI. However, they can not make any changes or edits.

RW = Read/Write access (full access). When "RW" is entered in a section of the user group definition, users with that group have read, write, and edit access to that part of the system, including its UI

To change a password, first log into the system under a user who has the RW capability assigned to Administer Users, or the **admin** level. Enter the SYS level, as shown in Figure 4-2 on page 4-2. Enter N for userNames, and a screen such as Figure 4-3 appears.

IMACS_200 | SYS | 06-07-06 15:27
Page: 1 of 1 USER ADMIN
User Name User Password User Group
admin ********** 1
Refresh | Add | dEl | Group | pgUp | pgDn | Main |

Figure 4-3.User Name Screen

To add a user, choose the **A** function. Use carriage returns to update a field, and arrow keys to move around in the screen. For Figure 4-4 below, the administrator chose Add, carriage return, typed in “Pastel” and return, right arrow, return, typed “flood” and carriage return, confirmed the password by typing in “flood” a second time and carriage return, right arrow to the group field, carriage return and then used the up arrow until ‘06’ appeared and hit carriage return. Don’t forget to save your changes!

Figure 4-4.Adding a user

4.3.3 Access Level Permissions

With the Admin level user, the Group setting can be changed on a group basis. Begin by accessing the User Name Screen as shown in Figure 4-3 on page 4-6. Select the Group option by typing “G”, and a screen such as in Figure 4-5 appears

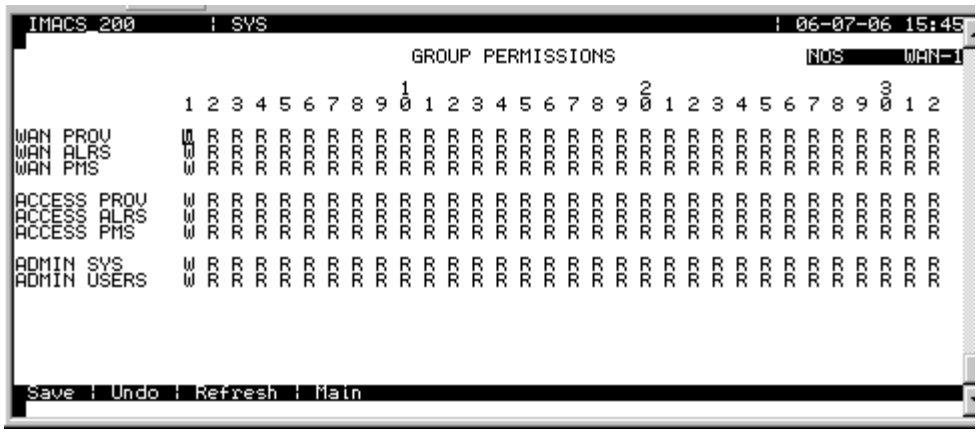

IMACS_200 : SYS : 06-07-06 15:45
GROUP PERMISSIONS NOS WAN-1
1 2 3 4 5 6 7 8 9 10 1 2 3 4 5 6 7 8 9 20 1 2 3 4 5 6 7 8 9 30 1 2
WAN PROV W R R R R R R R R R R R R R R R R R R R R R R R R R R
WAN ALRS W R R R R R R R R R R R R R R R R R R R R R R R R R R
WAN PMS W R R R R R R R R R R R R R R R R R R R R R R R R R R
ACCESS PROV W R R R R R R R R R R R R R R R R R R R R R R R R R R
ACCESS ALRS W R R R R R R R R R R R R R R R R R R R R R R R R R R
ACCESS PMS W R R R R R R R R R R R R R R R R R R R R R R R R R R
ADMIN SYS W R R R R R R R R R R R R R R R R R R R R R R R R R R
ADMIN USERS W R R R R R R R R R R R R R R R R R R R R R R R R R R
Save : Undo : Refresh : Main

Figure 4-5.Group Permissions Settings

Use the arrow keys to select the field and permission that you want to change, and access the write capability by issuing a carriage return. The user can then set the access level to **N**one, **R**ead only or Read Write (**RW**) as desired. Following is the description of the Access Levels, and what can be done in each.

WAN Provisioning

This covers all provisioning screens and activities associated with both the copper and optical WAN interfaces.

WAN Alarms

This covers all alarm reporting screens and activities associated with both the copper and optical WAN interfaces. Read access allows alarms to be viewed only. RW access allows changes to severity, thresholds etc. (any provisionable alarm attributes)

WAN PMs

This covers all performance monitoring screens and activities associated with both the copper and optical WAN interfaces. Read access allows PMs to be viewed only. RW access allows changes to intervals, thresholds etc. (any provisionable PM attributes)

Access Provisioning

This covers all provisioning screens and activities associated with all the access interfaces. This includes OHSU, HSU, SRU, voice, alarm, and Ethernet posts

Access Alarms

This covers all alarm reporting screens and activities associated with all the access interfaces. This includes OHSU, HSU, SRU, voice, alarm, and Ethernet posts. Read access allows alarms to be viewed only. RW access allows changes to severity, thresholds etc. (any provisionable alarm attributes)

Access PMs

This covers all performance monitoring screens and activities associated with OHSU, HSU, SRU, voice, alarm, and Ethernet interfaces. Read access allows PMs to be viewed only. RW access allows changes to intervals, thresholds etc. (any provisionable PM attributes)

Administer System

This covers system level activities such as IP addresses, inventory, software upgrade, data base backup, setting the real time clock, setting sync sources etc.

Administer Users

This covers the provisioning and administration of users and user groups. Read access allows user names and user group attributes to be viewed but not changed. RW access allows you to edit user names, passwords, and user group attributes. It also allows you to disable all users (ref. R-5.6.3.4 #5). You can never view passwords, even with RW access (ref R-5.6.3.1 #2). Users, once logged in, can always change their own password regardless of the attribute of this field in their user's group.

4.3.4 Other SYS port Settings

You also must set the additional port parameters described below in the SYS port Main Screen. Most of these are user-defined alphanumeric entries. To make new entries in these fields, first press <Enter> to highlight the current entry in the lower left of the screen. Then, type the new data on the keyboard. If you make a mistake, press either the backspace or <Delete> key to back up the cursor and erase the incorrect characters. Then, retype the correct characters. Finally, press <Enter> again to store the new entry in the field.

NODE ID

In this field, enter a 14-character node name for the Integrated Access System. This entry must be unique for each system in your network. It can have alphanumeric characters and spaces.

SYS CONT

In this field, enter the name of a person to contact for questions about the Integrated Access System. This field can have up to 23 alphanumeric characters, including spaces. For convenience, use the system administrator's name in this field.

SYS LOC

In this field, specify the location of the Integrated Access System. This field can have up to 23 alphanumeric characters, including spaces.

ALRM SEQ

The Alarm Sequence setting establishes how the sequence number for alarms is generated. Set this option to **all** if you want any alarm generated by the system to be assigned a sequence number. Or, set this field to **report** if you want only the alarms set to **report** to have sequence numbers.

ACO

The Alarm Cutoff (ACO) option reports a status to you based on the **latch** (condition held) or **cur** (current condition) setting.

4.3.5 SYStem Ethernet Port

The Ethernet port allows the user to telnet into the IMACS-200 and allows for remote management, configuration and downloading of host code via a 10baseT Ethernet port.

4.3.5.1 Setting Up the Ethernet Port

Before using the Ethernet port, the crafts person must perform the following steps:

11. From the SYS port Main screen in Figure 4-2, enter ‘I’ for tcp/Ip, as seen in figure Figure 4-6.

IMACS_200 | SYS | 06-06-06 17:07
1
NOS WAN-1
HOST IP STATE actv
HOST IP ADDR 172.16.74.16
HOST NETMASK 255.255.252.0
HOST TYPE host
DEFAULT IP TYPE local ethernet
DEFAULT IP SLOT n/a
DEFAULT IP TS n/a
DEFAULT GATEWAY 172.16.74.254
Ping | Netstat | Save | Undo | Refresh | Main

Figure 4-6.Setting up the Ethernet Port

12. Leave the HOST IP STATE as **stdby** for now.
13. Enter in the HOST IP ADDRESS: [**device IP address**]
14. Enter in the HOST NETMASK: [**IP mask**]
15. Select the HOST TYPE as either **host** or **gateway**.
16. Select the DEFAULT IP TYPE as either **none**, **local ethernet** or **wan**
    a. If **wan** is chosen, then the IP SLOT and IP TS will be accessible to the user. If this is the case, datafill these fields with the WAN and timeslot where the Ethernet port will be carried. Otherwise, these fields will be **n/a** by default.
17. Enter in the DEFAULT GATEWAY:[**IP address**]
18. Save the specified settings.
19. Go back up to the HOST I P STATE in step 2 and change it to **actv**
20. Save the specified settings.
21. From a PC on the same IP network, enter:
    a. Ping [device IP address]
    b. Telnet [device IP address]
22. From the IMACS-200:
    a. Ping PC on IP network
23. From a PC on a different network than the IP network:

a. Ping [device IP address]

b. Telnet [device IP address]

24. From the IAD, Ping PC on the network different from IP subnetwork.

4.3.6 Network Statistics Screens

The Network Statistics Screens provide maintenance and diagnostic information for the different protocols supported by this equipment. The system starts accumulating statistics when the TCP/IP Port is changed from **off** to **local** or **wan**, and it continues to store information until it is turned off.

Figure 4-7 shows the first of four Network Statistics Screens, and Figure 4-7throughFigure 4-9show the other three screens. To go to the first screen, press "**n**" in the TCP/IP Screen to choose **Netstat** from the bottom line of that screen. Table 4-6 lists the actions that can be taken from the Network Statistics Screens, and the following paragraphs describe the parameters in each screen.

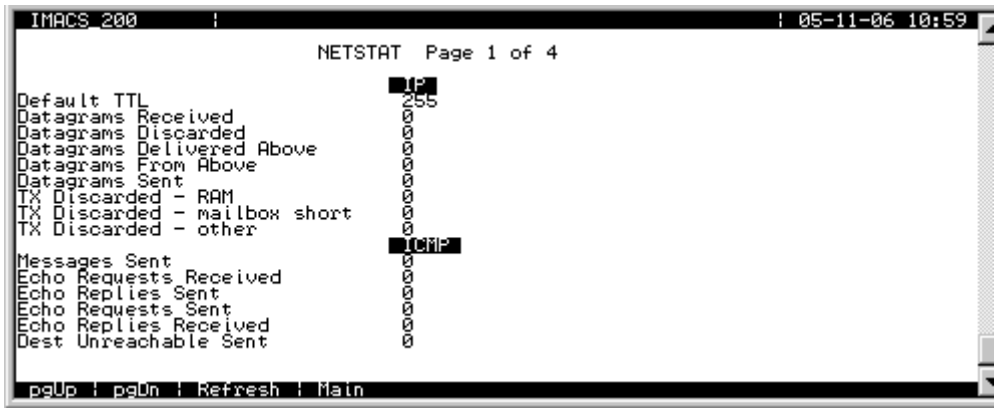


Figure 4-7.Typical Network Statistics Screen, Page 1

To move from one screen (page) to another, press "**d**" (**pgDn**) or "**u**" (**pgUp**). Pressing "**d**" goes to the next-highest page number. If you are on Page 4 when you press "**d**", you will wrap around to Page 1. Page 4 is currently not used on the IMACS-200, and therefore present not data. Pressing "**u**" goes to the next-lowest page number. If you are on Page 1 when you press "**u**", you will wrap around to Page 4.

Table 4-6. Network Statistics Screen Actions

Action	Function
pgUp	Scrolls backward through network statistics, one page at a time. If you are on the first screen (Page 1), automatically “wraps around” back to the fourth screen (Page 4).
pgDn	Scrolls forward through network statistics, one page at a time. If you are on Page 4, automatically “wraps around” back to Page 1.
Refresh	Since the system does not update statistics automatically, the Refresh command must be used to update information in statistics fields.
Main	Returns to the TCP/IP Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

4.3.6.1 IP Parameters

The IP parameters appear in the first Network Statistics Screen (Figure 4-7). These are described below.

Default TTL

The Default TTL field shows the Time To Live for information packets from transmission to delivery. The TTL for this system is 255 seconds.

Datagrams Received

The Datagrams Received field shows the number of IP datagrams (packets) received by the local system from the network host.

Datagrams Disported

The Datagrams Disported field shows the number of datagrams that were disported by the local system.

Datagrams Delivered Above

The Datagrams Delivered Above field shows the number of datagrams sent to the TCP layer of the network host to the local system.

Datagrams From Above

The Datagrams From Above field shows the number of information or traps sent by the local system to the UDP or TCP layer of the network host.

Datagrams Sent

The Datagrams Sent field shows the total number of datagrams sent by the local system to the network host.

TX Disported - RAM

The TX Disported - RAM field shows the total number of datagrams sent by the local system that were disported due to lack of free RAM memory.

TX Disported - Mailbox Short

The TX Disported - mailbox short field shows the total number of datagrams aborted by the local system because of a mail subsystem overflow.

TX Disported - Other

The TX Disported - other field shows the total number of datagrams disported due to other causes.

4.3.6.2 TCP State Parameters

The TCP state parameters appear in the third Network Statistics Screen (Figure 4-8). They are described below.

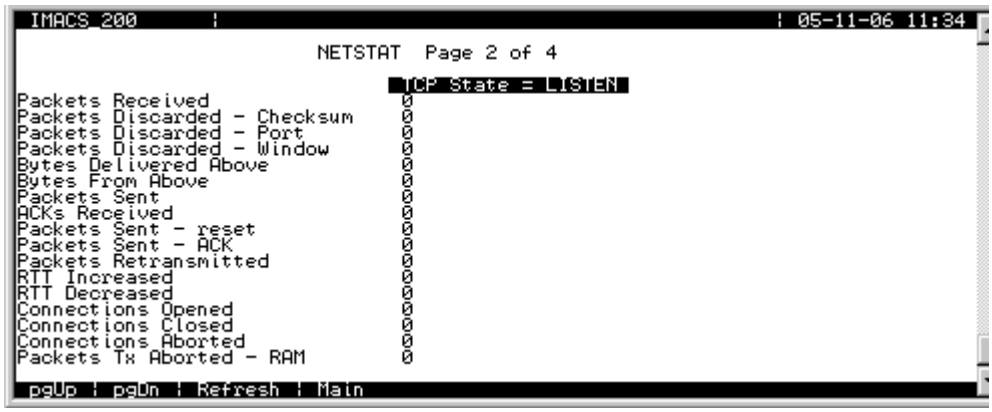

IMACS_200 | 05-11-06 11:34
NETSTAT Page 2 of 4
TCP State = LISTEN
Packets Received 0
Packets Discarded - Checksum 0
Packets Discarded - Port 0
Packets Discarded - Window 0
Bytes Delivered Above 0
Bytes From Above 0
Packets Sent 0
ACKs Received 0
Packets Sent - reset 0
Packets Sent - ACK 0
Packets Retransmitted 0
RTT Increased 0
RTT Decreased 0
Connections Opened 0
Connections Closed 0
Connections Aborted 0
Packets Tx Aborted - RAM 0
pgUp | pgDn | Refresh | Main

Figure 4-8.Typical Network Statistics Screen, Page 2

Packets Received

The Packets Received field shows the number of TCP packets received by the local system from the network host.

Packets Disported - Checksum

The Packets Disported - Checksum field shows the number of TCP packets that were disported by the local system because the checksum failed.

Packets Disported - Port

The Packets Disported - Port field shows the number of TCP packets that were disported by the local system because the port assignment was incorrect.

Packets Disported - Window

The Packets Disported - Window field shows the number of TCP packets that were disported by the local system because the window data was incorrect.

Bytes Delivered Above

The Bytes Delivered Above field shows the number of information or traps sent from TCP layer of the network host to the local system.

Bytes From Above

The Bytes From Above field shows the number of information or traps sent to the TCP layer of the network host from the local system.

Packets Sent

The Packets Sent field shows the total number of TCP packets that were transmitted to the network host by the local system.

ACKs Received

The ACKS Received field shows the total number of acknowledgments that were received by the local system from the network host.

Packets Sent - Reset

The Packets Sent - reset field shows the total number of TCP packets that were transmitted by the network host to the local system.

Packets Sent- ACK

The Packets Sent - ACK field shows the total number of TCP acknowledgment packets that were transmitted by the network host to the local system.

Packets Retransmitted

The Packets Retransmitted field shows the total number of TCP packets that were retransmitted by the local system to the network host.

RTT Increased

The RTT Increased field shows the number of times the retransmission time-out was increased because the system was busy.

RTT Decreased

The RTT Decreased field shows the number of times the retransmission time-out was decreased because the system was not busy.

Connections Opened

The Connections Opened field shows the total number of connections that were opened by the local system to the network host.

Connections Closed

The Connections Closed field shows the total number of connections that were closed by the local system to the network host.

Connections Aborted

The Connections Aborted field shows the number of times the connection was aborted because either the number of consecutive retransmissions was equal to 10 or retransmission time-out was equal to 15 minutes.

Packets TX Aborted - RAM

The Packets TX Aborted - RAM field shows the total number of packets sent by the local system which were aborted because of the lack of free RAM memory.

4.3.6.3 UDP Parameters

The UDP parameters appear in the fourth Network Statistics Screen (Figure 4-9). They are described below.

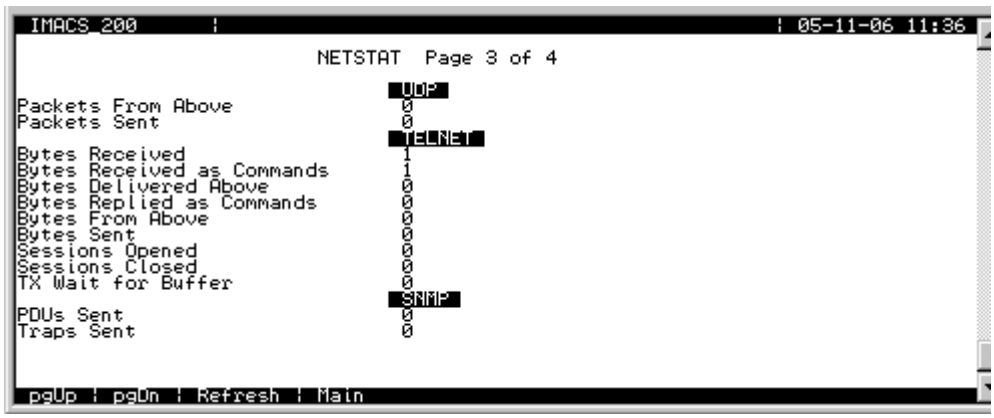


Figure 4-9.Typical Network Statistics Screen, Page 3

Packets From Above

The Packets From Above field shows the number of UDP packets sent by the local system to the network host.

Packets Sent

The Packets Sent field shows the number of UDP packets transmitted from the local system to the network host.

4.3.6.4 TELNET Parameters

The TELNET parameters also appear in the fourth Network Statistics Screen (Figure 4-9). They are described below.

Bytes Received

The Bytes Received field shows the total number of bytes that were received by the local system from the network host.

Bytes Receive as Commands

The Bytes Received as Commands field shows the total number of bytes that were received as commands by the local network from the network host.

Bytes Delivered Above

The Bytes Delivered Above field shows the total number of bytes that were transmitted by the network host to the local system.

Bytes Replied as Commands

The Bytes Replied as Commands field shows the total number of bytes that were transmitted as commands by the local system to the network host.

Bytes From Above

The Bytes From Above field shows the total number of bytes that were received by the network host from the local system.

Bytes Sent

The Bytes Sent field shows the total number of bytes that were transmitted by the local system to the network host.

Sessions Opened

The Sessions Opened field shows the total number of sessions that were opened by the local system with the network host.

Sessions Closed

The Sessions Closed field shows the total number of sessions that were closed by the local system with the network host.

TX Wait for Buffer

The TX Wait for Buffer field shows the total number of transmissions that were delayed by the local system for free memory in the buffer.

4.3.6.5 SNMP Parameters

The TELNET parameters also appear in the fourth Network Statistics Screen (Figure 4-9). They are described below.

PDUs Sent

The PDUs Sent field shows the number of Protocol Data Units sent from the local system. A Protocol Data Unit is a data object exchanged by protocol drivers, usually containing both protocol control information and user data.

Traps Sent

The Traps Sent field shows the total number of SNMP traps that were transmitted by the local system to the network host.

4.4 Host Software Upgrade Procedure

This section provides procedures for upgrading Integrated Access System host software. The procedures for upgrading from 1.0.0 to the next release.

The host software is stored in flash memory facilitating download of future software releases to the IMACS-200.

4.4.1 Equipment Requirements

Following are the equipment requirements for host software upgrade.

- IMACS-200 equipped with latest host software
- Laptop computer running Windows OS
- Serial port cable to connect to the TERM port on the Integrated Access System

- The next available Host software on disk or loaded into laptop computer

4.4.2 Laptop Setup

Follow the steps listed below to set up the laptop computer.

1. Boot the laptop.
2. Click "**START**".
3. Select "**Programs**", "**Accessories**"**,** and click on "**HyperTerminal**".
4. In the HyperTerminal window, double click on "**Hypertrm**" icon.
5. In the *New Connection* window*, Enter Name*: enter **Upgrade**.
6. Select icon and click **OK**.
7. In *Connect to Window, Connect Using*, click down arrow and select "**Direct to COM1**".
8. Click **OK**.
9. In COM 1 window, set BITs per second to "**9600**" (leave other settings as is) click **OK**.
10. In Upgrade window, click **File** menu, select **Properties**, and select **Settings**.
11. In Emulation window, select **VT100** and click **Terminal Setup**.
12. Select **132 column mode**, click **OK**.
13. Close **Properties** window and save.
14. Right click on **Upgrade Icon** and select **Create Shortcut**.
15. Drag shortcut to the desktop.

4.4.2.1 Log Upgrade Activity

Create a log to record upgrade activity on a per-site basis that includes the following information:

- Site name, date and time, and name of technician performing upgrade
- System name(s) and number of SYS ports per system
- Model, serial number, and host version of previous SYS ports
- Model, serial number, and host version of new SYS ports

- Model and serial number of Interface port

4.4.3 Upgrade Preparation

Follow the steps listed below to perform an upgrade.

1. Connect the laptop to the TERM port on the Integrated Access System.
2. Press **Enter,** and log into the system.
3. Using the arrow keys, move the cursor to **SYS** and press **Enter**.
4. Verify and record the current host software version.

4.5 Software Download Procedures

4.5.1 XMODEM Protocol Binary Download

Follow the steps listed below to perform an XMODEM protocol bin download.

1. Set up a direct connection to the VT-100 craft port.
2. Locally connect the PC to the VT-100 craft port. Log into the system with *Administer System* access.
3. Highlight SYS and press "**P**".
4. The binary buffer area appears, and one of the buffers displays in an active state. The other buffer may be empty or may have a file in it.
5. If both buffers have files in them, highlight the buffer that is not active. Press the **Enter** key and four options appear at the bottom of the screen. Using the arrow keys, highlight the *erase* parameter and press **Enter**. When the system finishes erasing the buffer it will indicate an empty state.
6. Using the arrow keys, highlight the *empty buffer* area and press **Enter**. Four parameters will appear on the screen. Using the arrow keys, select the *dnload* (download) parameter and press **Enter**. Two parameters will appear at the bottom of the screen.
7. Using the arrow keys, select the *XMODEM* parameter and press **Enter**. The letter "*C*" will begin duplicating across the screen. This is normal and does not indicate a problem.
8. At the HyperTerminal screen, select *file transfer* and send the file. Choose the appropriate binary file to download using the *XMODEM* protocol to BIN buffer 1 or 2, depending upon which bin is empty.

9. Following completion of the download process, make the newly loaded bin active and then erase the existing firmware from the now inactive bin. Perform the download process again so that both buffers have the same firmware applied to them.

4.5.2 Pre-TFTP Binary Upload/Download Preparation

To perform binary (bin) uploads/downloads via the TFTP function, one of the following two methods of connection to a Local Area Network (LAN) network must first be selected.

The first option requires that the system to which you will download be powered. The connection must be made either in the box that will receive the downloaded file or in a remote box routed through the local SYS that is set as a gateway using an IP protocol. You must be able to ping the IMACS-200 and the local and remote SYS host IP addresses from the PC or server that you intend to use as a TFTP server and vice versa. You may need to change the routing table on your PC to include the IMACS-200 ethernet address as the gateway, or the local host address as the gateway for the system receiving the file as the destination IP address.

Note: *Your PC must have some sort of TFTP server software installed and running when you are downloading the binary files to the system. If you are using TFTPD type software it is easier if you set the root directory to indicate where the binary file is located at the TFTPD root screen. This eliminates the need to enter a path at the file name screen during the download process. If you are running a TFTP software package, consult the user guide accompanying the software for details on configuring and using the software.*

4.5.3 Loading the Software Image Using the Ethernet Port

Follow the steps listed below to perform an software download and activate new firmware on the SYS. It may be helpful to backup the device configuration before activating the downloaded software. Activating software resets the SYS and

1. Using a Telnet session over the Ethernet port, establish a connection to the desired IAD.

   To setup the Ethernet port, see “Setting Up the Ethernet Port” on page 9.

2. At the Login screen, enter the system password.

   The Main screen appears.

3. With the cursor on the SYS level, press **P**.

   The Flash screen appears with status and data for memory blocks 1 and 2.

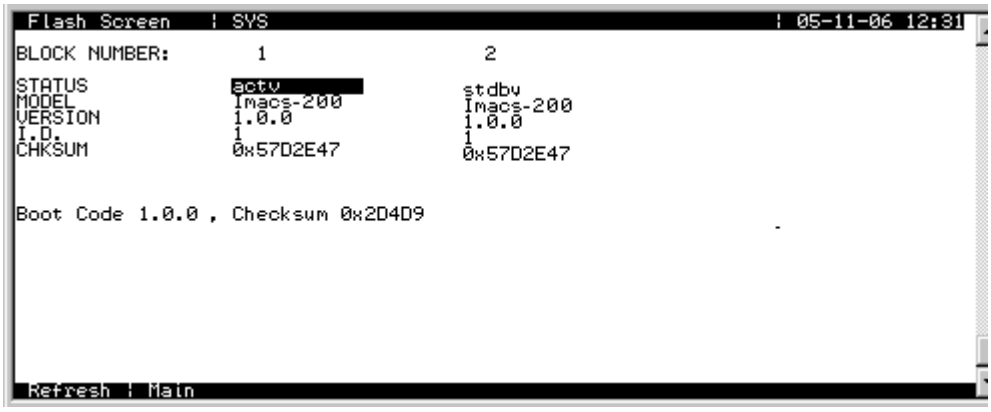


Figure 4-10.Flash Screen

4. Select the block to be replaced or updated. Press **Enter**.

   The Flash screen appears with the software download commands at the bottom of the screen.

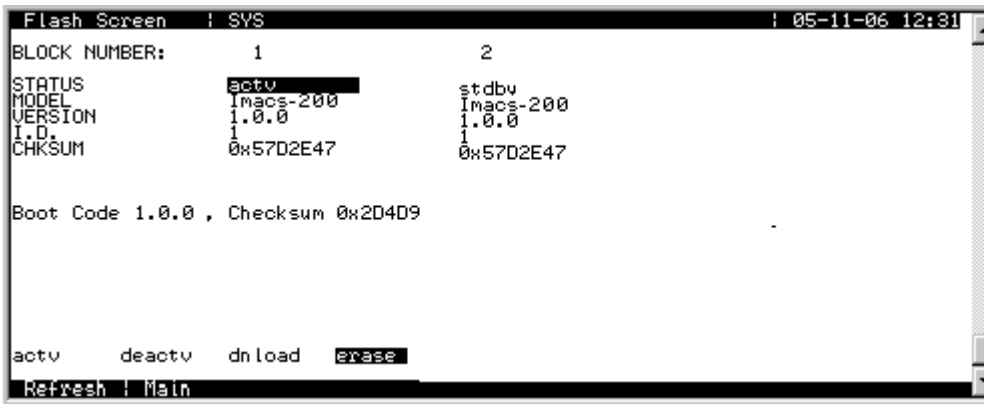


Figure 4-11.Flash Screen with Commands

5. Select the desired command. Press **Enter**.

   The activate, download, and erase cannot be performed on the active software.

6. Enter **Y** to replace the current software.

   The system removes the current software from the selected block.

7. Select the **tftp** option. Press **Enter**.

8. Enter the desired number of mismatch retries. Press **Enter**.

Default value is 20.

9. Enter the desired number of timeout retries. Press **Enter**.

   Default value is 4. The Flash Screen appears with the software removed from the selected bin.

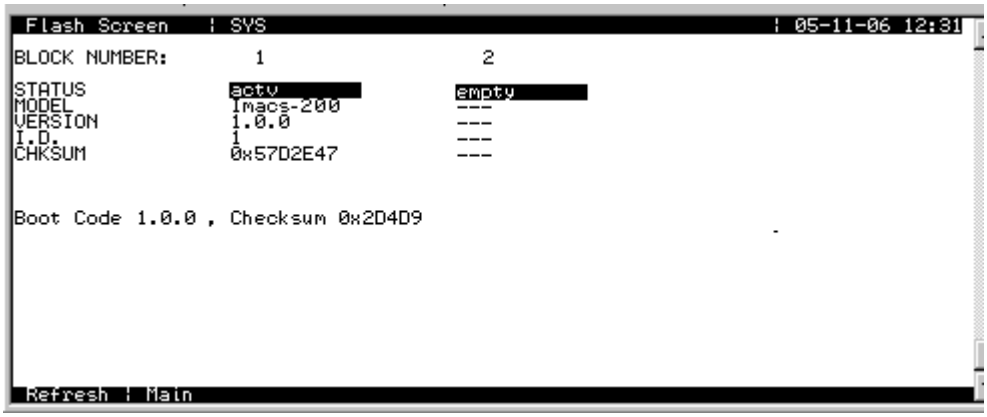


Figure 4-12.Flash Screen with Software Removed

10. Enter the IP address of the TFTP server. Press **Enter**.

11. Enter the firmware filename. Press **Enter**.

    Filenames contain "**SYS**" and the version number followed by an underscore, the desired block number and "**.bin**". For example, using filename SYS541_2.bin downloads the SYS software release 1.0.0.1 to SYS block 2.

    The download software appears in the Flash screen.

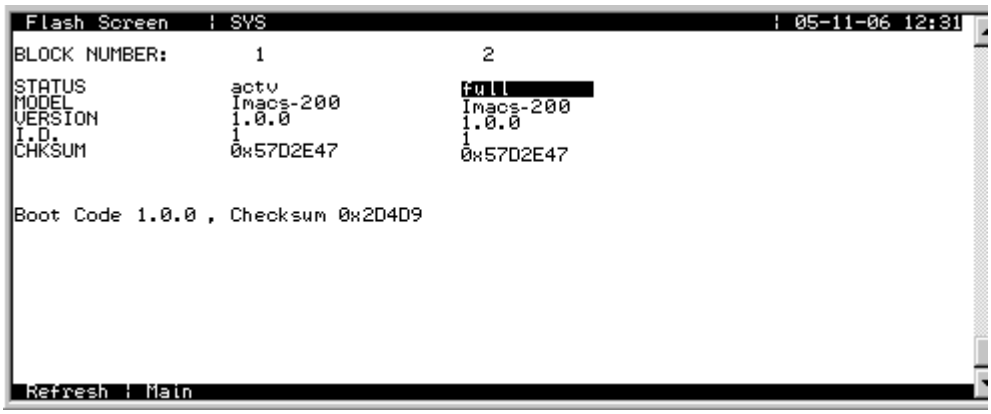


Figure 4-13.Flash Screen with Downloaded Software

12. With the desired software block selected, press **Enter**.

    The activate and deactivate options appear at the bottom of the screen.

13. Verify the checksum value for the software load to ensure a successful download.

    Checksum values appear in the product release notes. Even for the same software load, the checksum values differ for each software block.

14. Select **Activate** and press **Enter**.

    This resets the SYS and makes the selected software the current active load.

    Upon SYS reset and activation, you will loss the current Telnet connection.

4.6 SYS port Error Messages

Refer to Appendix B in this Guide for further information on Error Messages regarding this port.

4.7 SYS port Troubleshooting

On power-up, the SYS port performs a self-test. This is the only diagnostic available for the SYS. A “healthy” active SYS will have a green LED lit on the front panel.

The indications that a SYS is not on-line are:

- Continuous amber alarm LED on front panel or the LEDs continually cycling through the orange, green, red, blank sequence.
- Inability to communicate with the system by any means (VT-100 Term, Telnet, etc.).

If the SYS port is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

Chapter 5
WAN ports

5.1 Introduction

This chapter provides configuration and troubleshooting information for the Wide-Area Network (WAN) ports. There are four WAN ports available on the IMACS-200.

The WAN ports manage the flow of data through the IMACS-200 network. They terminate T1 lines and generate or receive network timing clocks. They also cross-connect DS0 time slots, to pass data through the system from one T1 line to another.

5.2 WAN port Descriptions

The WAN ports are used for connection to a 1.544 Mbps T1 network. There are four ports available on the IMACS-200, ports numbered W1-1, W1-2, W1-3 and W1-4. Connection to the WAN ports are made through the rear panel of the IMACS-200, labeled T1/E1 and numbered 1 through 4. E1 will be available in a future release. The access to these ports is via four separate RJ45 connectors. Refer to Section Table 2-6. on page 10 of the System Installation chapter for pinouts of the WAN connections.

5.3 WAN port User Screens and Settings

5.3.1 T1 Settings

Figure 6-1 shows the WAN port Main Screen for T1 operation.

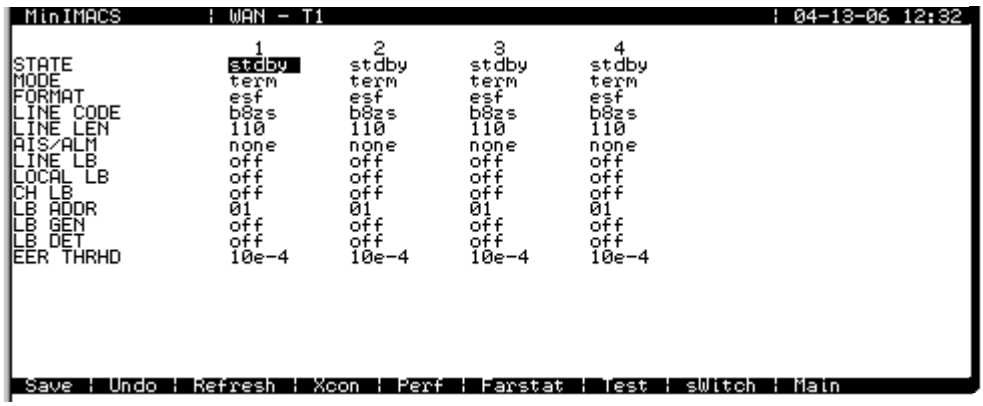

MinIMACS ¦ WAN - T1 ¦ 04-13-06 12:32
1 2 3 4
STATE stdby stdby stdby stdby
MODE term term term term
FORMAT esf esf esf esf
LINE CODE b8zs b8zs b8zs b8zs
LINE LEN 110 110 110 110
AIS/ALM none none none none
LINE LB off off off off
LOCAL LB off off off off
CH LB off off off off
LB ADDR 01 01 01 01
LB GEN off off off off
LB DET off off off off
EER THRHD 10e-4 10e-4 10e-4 10e-4
Save ¦ Undo ¦ Refresh ¦ Xcon ¦ Perf ¦ Farstat ¦ Test ¦ sWitch ¦ Main

Figure 5-1.WAN port Main Screen

Table 6-1 summarizes the actions you can perform from this screen, and Table 6-2 lists the settings controlled on the screen along with their possible and default values.

Table 5-1. T1 Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., performance and test data).
Perf	Brings up the Performance Data Screen. See the Performance Data section of this chapter.
Farstat	Shows the far-end network register data.
Test	Initiates and monitors testing of all WAN port ports. Refer to the Test section of this chapter.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or abandon your changes.

Table 5-2. T1 Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
FORMAT	d4 esf		esf
LINE CODE	ami b8zs		b8zs
LINE LEN	110 220 330 440 550 660 0DB 7.5DB 15DB 22.5DB		110
LINE LB	off on		off
LOCAL LB	off on		off
LB GEN	off llb plb nlb		off
LB DET	w/to off on		w/to
EER THRHD	10e-4 through 10e-9 none		10e-4

STATE

In the standby state, the WAN port is electrically disconnected from the external network. Set State setting to **stdby** (standby) when setting up your WAN links, then changes it to **actv** (active) when starting normal operations.If the WAN is in loopback due to a command from a remote device, the loopback will be dropped if you switch to **stdby**.

FORMAT

The Frame setting toggles the frame format to be used on the WAN link so that it matches the frame format used by the T1 carrier. Set the format Parameter based on the type of frame format the T1 carrier requires. The options are **d4** (normal superframe) or **esf** (extended superframe).

LINE CODE

The Line Code setting matches the Line code used by the T1 interface to that used by the T1 network. Set the Line Code to the type of Line Code used. The options are **ami** and **b8zs**.

LINE LEN

The Line Length setting adjusts the T1 power level to compensate for the distance the signal must travel before it reaches the first T1 line repeater or other device. For the DS1 interface, the options are **110**, **220**, **330**, **440**, **550**, and **660** feet or **0**, **7.5**, **15**, and **22.5** dB.

LINE LB

The Line Loopback setting loops the T1 line back towards the network, as shown in Figure 5-2. This loopback also continues sending the incoming data toward the CPE. Choosing **on** allows you to test the end-to-end T1 circuit path from the far end. Choosing **off** disables the loopback and restores the normal signal path in both directions. If the WAN is in loopback due to a remote device, the loopback will be dropped if you choose **on.**

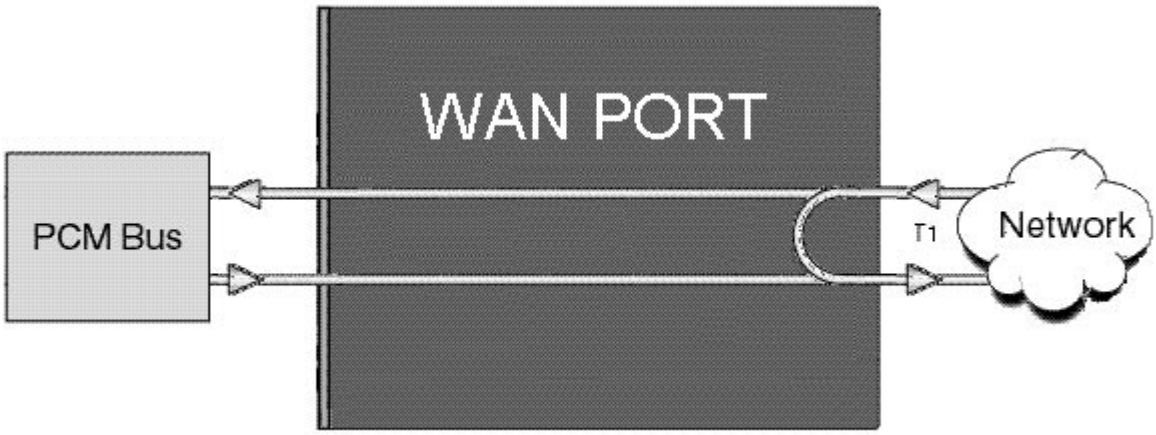


Figure 5-2.Line Loopback

LOCAL LB

The Local Loopback setting allows you to loop the full T1 line back toward the CPE, as shown in Figure 5-3. This loopback also continues sending CPE data towards the network. Choosing **on** allows you to test the local system. Choosing **off** disables the loopback and restores the normal signal path in both directions. If the WAN is in loopback due to a command from a remote device, the loopback will be dropped if you choose **on**

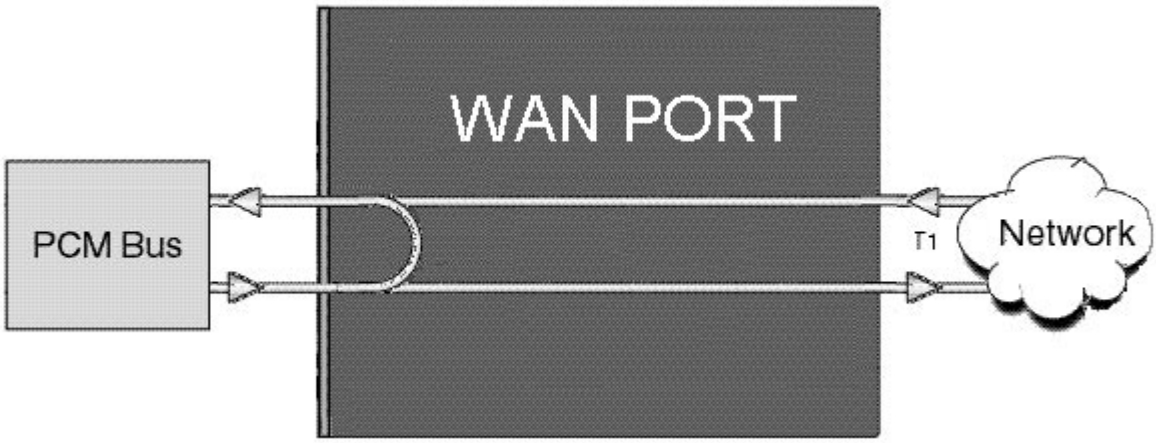


Figure 5-3.Local Loopback

LB GEN

The Loopback Generate setting (available only in esf format) generates out-band diagnostic codes that are sent to the remote equipment. These codes are compatible with DDS networks and allow you to command a latching loopback at remote DDS equipment. The options are **off**, **llb** (Line Loopback), **plb** (Payload Loopback) and **nlb** (Network Loopback).

Selecting **off** generates a loopback deactivate command corresponding to the last activation command generated. e.g. if you send a **plb** command and then send an **off** command, the **off** command would be payload deactivate. Note that the actual transmission of the command happens after you press '**s**' for **Save**. If you have already sent one of the loopback activation commands, it is recommended that you send an **off** command before sending another loopback activation command. e.g. this set of selections **plb, off, llb, off** transmits the following commands: payload activate, payload deactivate, line activate, and line deactivate.

LB DET

This option allows the card (available only in esf format) to detect DS1 channel, and ANSI T1.403 loopbacks. When set to **off**, no T1 loopbacks can be detected. When set to **on**, T1 Loopbacks will be detected and maintained until a loop down is detected. The with/time-out (**w/to**) is the same as **on** except that if no loop down is detected after ten minutes, the loopback will self-terminate. If the WAN is in loopback due to a command from a remote device, the loopback will be dropped if you choose **off.**

EER THRHD

The Excessive Error Rate Threshold selects the error rate, which an alarm is declared. This setting interacts with the EER setting in the Alarm Filters of your system. The options are **10e-4** through **10e-9,** or **none**.

5.3.2 Cross-Connect (XCON)

The Cross-Connect (**Xcon**) command in the Main screen level allows you to view and add the time slot or DS0 assignments that have been set up in the system. From the main IMACS-200 screen, press ‘X’ for the Xcon option. This screen will display to the user all the of the WAN to WAN cross-connections that have been made on the IMACS-200. New connections can be added by selecting the Add function as shown in Figure 5-4, and using the arrow keys to select and update the various fields. To see all of the connections made on the IMACS-200, the user can type ‘V’ for ‘View All”. A display such as is shown in Figure 5-5 will appear. This screen can also be used to initiate changes in the WAN to WAN cross-connects, as well as changing the names of Voice circuits. Time slot and cross-connect configuration are discussed in the System Operations chapter of this manual.

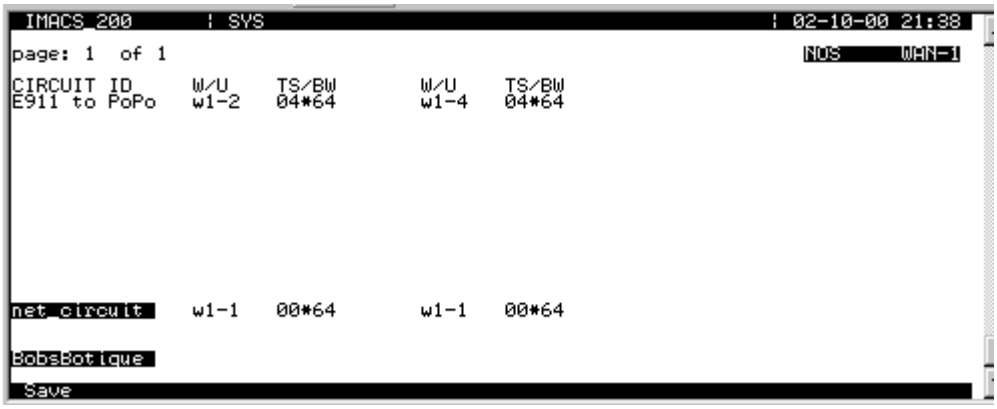

IMACS_200 ¦ SYS ¦ 02-10-00 21:38
page: 1 of 1
NOS WAN-1
CIRCUIT ID W/U TS/BW W/U TS/BW
E911 to PoPo w1-2 04*64 w1-4 04*64
net_circuit w1-1 00*64 w1-1 00*64
BobsBotique
Save

Figure 5-4.Adding a WAN to WAN Cross-connect

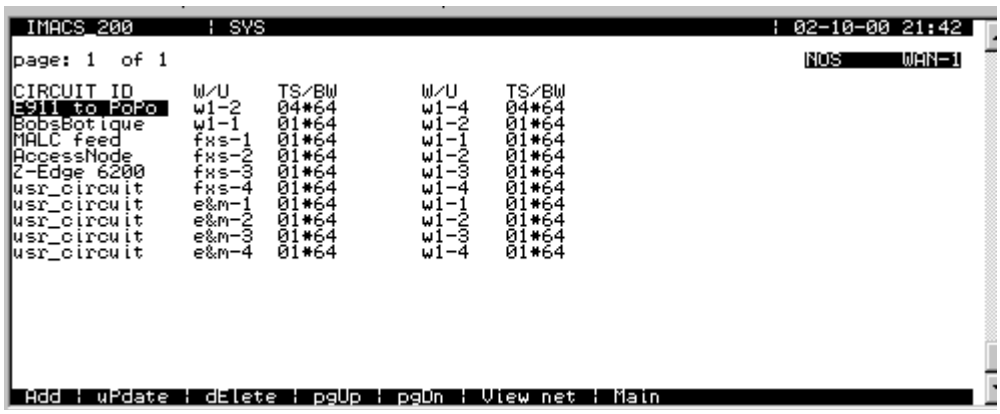

IMACS_200 ¦ SYS ¦ 02-10-00 21:42
page: 1 of 1
NOS WAN-1
CIRCUIT ID W/U TS/BW W/U TS/BW
E911 to PoPo w1-2 04*64 w1-4 04*64
BobsBotique w1-1 01*64 w1-2 01*64
MALC feed fxs-1 01*64 w1-1 01*64
AccessNode fxs-2 01*64 w1-2 01*64
Z-Edge 6200 fxs-3 01*64 w1-3 01*64
usr_circuit fxs-4 01*64 w1-4 01*64
usr_circuit e&m-1 01*64 w1-1 01*64
usr_circuit e&m-2 01*64 w1-2 01*64
usr_circuit e&m-3 01*64 w1-3 01*64
usr_circuit e&m-4 01*64 w1-4 01*64
Add ¦ uPdate ¦ dElete ¦ pgUp ¦ pgDn ¦ View net ¦ Main

Figure 5-5.T1 Cross-Connect Screen (display only)

5.3.3 Performance Data

All WAN ports gather performance data. The performance data for a T1 line is viewed by typing "**p**" in the WAN port Main Screen, to invoke the **Perf** command. Performance data is accumulated for 15-minute increments that include the current period and the previous 96 periods (24 hours), which are accessed via the **pgUp** and **pgDn** commands of the Main Screen. Performance data can be viewed for each WAN port by moving to that port and then selecting the "**p**" option.

In an T1 environment, an error is defined as any CRC-4 error, Controlled Slip, or OOF error.

Figure 5-6 shows a typical T1 Performance Data Screen. The performance statistics are gathered and displayed in 15-minute intervals. Lines in each of the columns represent periods when no seconds have accumulated.

In the AT&T mode, two sets of registers accumulate performance data for 4 WAN links. The user registers and network registers are driven by the same errored events. However, they can be cleared separately. You can view both the user and network registers, but you can only clear the user registers. The network only has access to the network registers, and can only clear those registers. The ANSI and T1 WAN links have only one set of registers.

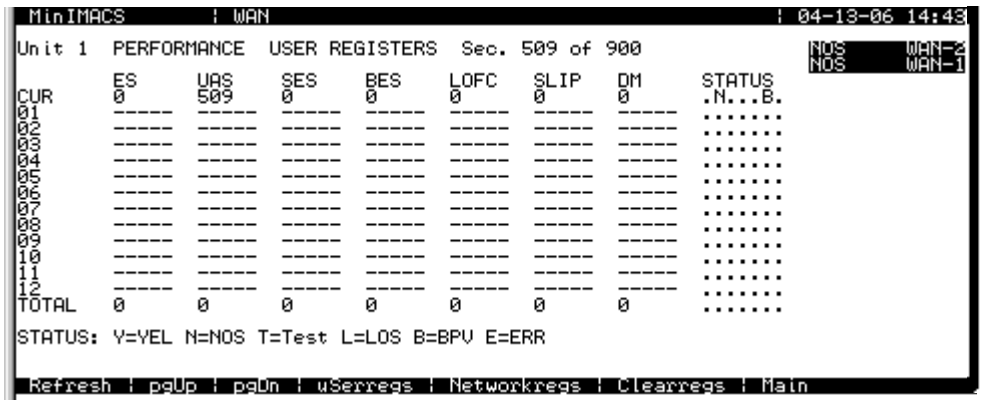

MinIMACS : WAN : 04-13-06 14:43
Unit 1 PERFORMANCE USER REGISTERS Sec. 509 of 900
NOS WAN-2
NOS WAN-1
ES UAS SES BES LOFC SLIP DM STATUS
CUR 0 509 0 0 0 0 0 .N...B.
01 ----- ----- ----- ----- ----- ----- ----- .....
02 ----- ----- ----- ----- ----- ----- ----- .....
03 ----- ----- ----- ----- ----- ----- ----- .....
04 ----- ----- ----- ----- ----- ----- ----- .....
05 ----- ----- ----- ----- ----- ----- ----- .....
06 ----- ----- ----- ----- ----- ----- ----- .....
07 ----- ----- ----- ----- ----- ----- ----- .....
08 ----- ----- ----- ----- ----- ----- ----- .....
09 ----- ----- ----- ----- ----- ----- ----- .....
10 ----- ----- ----- ----- ----- ----- ----- .....
11 ----- ----- ----- ----- ----- ----- ----- .....
12 ----- ----- ----- ----- ----- ----- ----- .....
TOTAL 0 0 0 0 0 0 0 .....
STATUS: Y=YEL N=NOS T=Test L=LOS B=BPV E=ERR
Refresh : pgUp : pgDn : uSerregs : Networkregs : Clearregs : Main

Figure 5-6.Typical Performance Data Screen

Table 6-3 lists the actions available from the Performance Data Screen.

Table 5-3. Performance Data Screen Actions

Action	Function
Refresh	Because statistics are not calculated in real time, the Refresh command must be used to update the screen with new information.
pgUp	Pages through the performance statistics for the current 15 minute period and periods 96-1.
pgDn	Pages through the performance statistics for the current 15 minute period and periods 1-96.

uSerregs	Allows you to view the User Registers. Not shown for T1 operations because it is the only set of registers for that mode.
Networkregs	Allows you to view the Network Registers. When you are viewing the network registers, the Clear Registers option disappears. (This action is not available in D4 mode or T1 operations.)
Clearregs	Clears the User Registers. Network statistics remain the same.
Main	Returns to the WAN port Main Screen.

ES

An Errored Second (ES) is a second with one or more CRC-6 (ESF), or CRC-4 (T1) errors, one or more Out-Of-Frame (OOF) errors, or one or more Controlled Slips.

UAS

An Unavailable Second (UAS) is any second during which service is unavailable. An unavailable signal state is declared after ten consecutive Severely Errored Seconds (SESs) are logged. An unavailable state is cleared after ten consecutive non-Severely Errored Seconds are logged. Unavailable Seconds are also accumulated if the port has an out-of-service (OOS) condition.

SES

A Severely Errored Second (SES) is any second with 320 or more CRC-6 (T1 ESF), or CRC-4 (T1) errors. Or, an SES can be any second with one or more Out-Of-Frame (OOF) errors.

BES

A Bursty Errored Second (BES) is any second with more than one and fewer than 320 CRC-6 (ESF), or CRC-4 (T1) errors.

LOFC

The Loss of Frame Count (LOFC) is the number of times a Loss Of Frame (LOF) is declared. An LOF is declared after 2.5 seconds of a continuous Loss Of Synchronization (LOS) or Out-Of-Frame (OOF) condition. The LOF is cleared after no more than 15 consecutive seconds without another LOS or OOF.

SLIP

A Slipped Second is any second that contains one or more Controlled Slips. A Controlled Slip is the deletion or replication of a T1 frame by the receiving equipment.

DM

A Degraded Minute (DM) is any minute during the reporting period that has an error rate greater than 10^{-6} as described in ITU-T G.821. The count for this field is from 1 to 15, rather than 1 to 900 for the other fields.

STATUS

If one of the described errors occurs during any of the 15-minute intervals, the status column for that period would display the code for that error. The codes are displayed at the bottom of the screen. The values are **Y** (Yellow Alarm received), **N** (No Signal), **T** (Test Mode - line loopback, local loopback, payload loopback, or standby), **L** (Loss of Synchronization – 2 out of 4 frame bits in error), **B** (Bipolar Violation), and **E** (Excessive Error Rate).

5.3.4 Far-End Performance Data

The Far-End Performance Data Screen is similar to the Performance Data Screen. The same statistics are collected in a slightly different manner. Figure 5-7 shows a typical display of far-end network register data for ANSI T1.403 mode, the only mode supported by the IMACS-200. To view the far-end performance data, press "**f**" (**Farstat** command) in the WAN port Main Screen.

When **Farstat** is selected, the far end generates one-second performance reports and sends them to the local system, where they are then stored.The message at the bottom of the screen shown in Figure 5-7 refreshes once per second as this data is gathered.

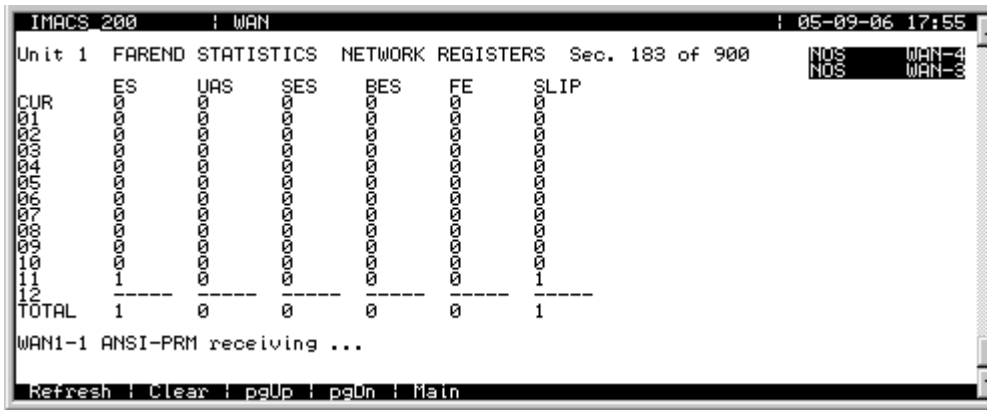

IMACS 200 : WAN : 05-09-06 17:55
Unit 1 FAREND STATISTICS NETWORK REGISTERS Sec. 183 of 900
NOS WAN-4
NOS WAN-3
ES UAS SES BES FE SLIP
CUR 0 0 0 0 0 0
01 0 0 0 0 0 0
02 0 0 0 0 0 0
03 0 0 0 0 0 0
04 0 0 0 0 0 0
05 0 0 0 0 0 0
06 0 0 0 0 0 0
07 0 0 0 0 0 0
08 0 0 0 0 0 0
09 0 0 0 0 0 0
10 0 0 0 0 0 0
11 1 0 0 0 0 1
12 ----- ----- ----- ----- ----- -----
TOTAL 1 0 0 0 0 1
WAN1-1 ANSI-PRM receiving ...
Refresh : Clear : pgUp : pgDn : Main

Figure 5-7.Far-End Performance Data Screen

Note: *Asterisks (*) are displayed when performance data is unavailable.*

Press "**c**" (**Clear** command) from the bottom line of this screen to send a FDL message to the far end and also clear the local display. The following message will now appear:

"**Ok to clear performance (y/n)?"**

Press "**y**" to clear the statistics, or "**n**" to leave the screen contents intact. To view the far-end information again, press "**r**" (restore) to send an FDL message and refresh the screen. Table 6-4 lists the actions available from the above screen.

Table 5-4. Far-End Performance Data Screen Actions

Action	Function
Refresh	Because data is not calculated in real time, the Refresh command must be used to update the screen with new information.

Clear	Clears the Far-End Network Registers display on the local terminal.
PgUp	Pages through the performance statistics for the current 15-minute period and periods 96-1.
PgDn	Pages through the performance statistics for the current 15-minute period and periods 1-96.
Main	Returns to the WAN port Main Screen.

ES

An Errored Second (ES) is a second with one or more CRC-6 (ESF) or BPV (D4/D-Frame) errors, one or more OOFs, or one or more Controlled Slips.

UAS

An Unavailable Second (UAS) is any second during which service is unavailable. An unavailable signal state is declared after ten consecutive Severely Errored Seconds (SESs) are logged. An unavailable state is cleared after ten consecutive non-Severely Errored Seconds are logged. Unavailable Seconds are also accumulated if the port has an out-of-service (OOS) condition.

SES

A Severely Errored Second (SES) is any second with 320 or more CRC-6 (ESF) or BPV (D4/D-Frame) errors, or one or more OOF errors.

BES

A Bursty Errored Second (BES) is any second with more than one and fewer than 320 CRC-6 (ESF) or BPV (D4/D-Frame) errors.

FE

The Framing Error (FE) is incremented whenever an incorrect or unexpected framing bit is received in a one second window.

SLIP

A Slipped Second is any second containing one or more Controlled Slips. A Controlled Slip is the deletion or replication of a DS1 frame by the receiving equipment.

5.3.5 Test Screen

Pressing "**t**" (**Test** command) in the WAN port Main Screen brings up the screen shown in Figure 5-8. From this screen, you can create test situations between WAN ports or between a single WAN port and data test equipment at a remote site. Table 6-5 lists the actions you can perform from the bottom line of this screen. Table 6-6 lists the settings controlled on this screen along with their possible values.

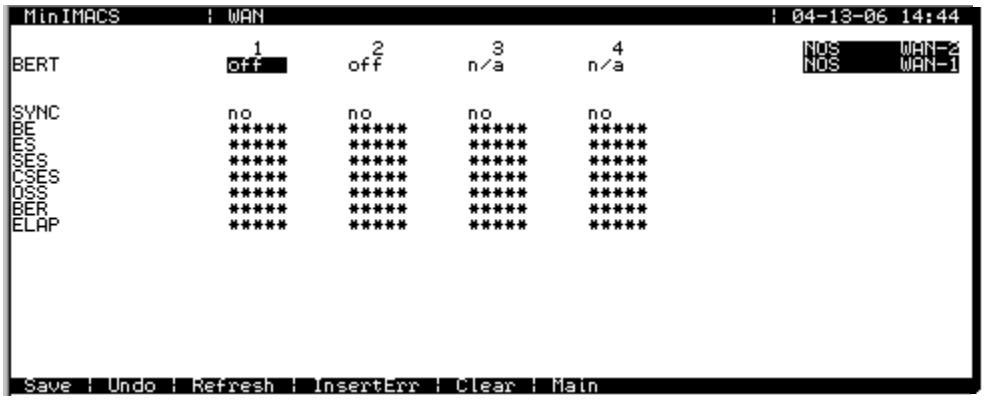

MiniMACS : WAN : 04-13-06 14:44
1 2 3 4
BERT off off n/a n/a
NOS WAN-2
NOS WAN-1
SYNC no no no no
BE ***** ***** ***** *****
ES ***** ***** ***** *****
SES ***** ***** ***** *****
CSES ***** ***** ***** *****
OSS ***** ***** ***** *****
BER ***** ***** ***** *****
ELAP ***** ***** ***** *****
Save : Undo : Refresh : InsertErr : Clear : Main

Figure 5-8.Typical WAN port Test Screen

Table 5-5. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., performance and test data).
Insert Err	Allows you to manually insert a single bit error into the data signal. This does not cause a CRC error.
Clear	Clears the Test Screen and resets all counters to zero.
Main	Returns to the WAN port Main Screen. If changes are made to settings and not saved, you will be prompted to save or abandon those changes.

Table 5-6. WAN port Test Screen Options

Parameter	User Options	Notes	Default
BERT	off mark space 1:1 1:7 3:24 qrss	1	off
SYNC	information only–no user options		
BE	information only–no user options		
ES	information only–no user options		
SES	information only–no user options		
CSES	information only–no user options		
OSS	information only–no user options		

BER	information only–no user options		
ELAP	information only–no user options		

BERT

The Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected WAN port. The patterns that can be selected are **off**, **mark** (all ones), **space** (all zeros), **1:1** (0101), **1:7** (0100 0000), **3:24** (this pattern requires 3 bytes to display), **qrss** (quasi-random signal source).

SYNC

The Synchronization (SYNC) field tells you if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment. Since this is an information-only field, there are no user-selectable parameters.

BE

The Bit Error (BE) field shows the total number of bit errors logged. Since this is an information-only field, there are no user-selectable parameters.

ES

The Errored Seconds (ES) field shows the total number of seconds in which any errors were detected. Since this is an information-only field, there are no user-selectable parameters.

SES

The Severely Errored Seconds (SES) field shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1×10^{-3}). Since this is an information-only field, there are no user-selectable parameters.

CSES

The Consecutive Severely Errored Seconds (CSES) field is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds. Since this is an information-only field, there are no user-selectable parameters.

OSS

The Out of Synchronization Seconds (OSS) field shows the number of seconds that the WAN BERT has been out of synchronization. Since this is an information-only field, there are no user-selectable parameters.

BER

The Bit Error Rate (BER) field shows the rate at which errors are being logged. The system calculates BER by dividing the number of bit errors (BE) by the total number of bits transmitted during the test. Since this is an information-only field, there are no user-selectable parameters.

ELAP

The Elapsed time setting shows the running tally of the total number of seconds during the test. Since this is an information-only field, there are no user-selectable parameters.

5.4 WAN port Error Messages

Refer to Appendix B in this Guide for further information on Error Messages regarding this port.

5.5 WAN port Troubleshooting

The WAN port (or a T1 port on it) may be faulty if a CGA-Red alarm is in progress on either port of the port. This alarm occurs if the incoming network signal is lost, or if the WAN port is out of frame with that signal. To isolate the trouble, proceed as follows:

1. See if similar alarms are also present on any other T1 lines and WAN ports in the system. If so, the trouble may be with the Interface port, which connects the T1 signals from the WAN ports to the external network. If the trouble is only on one T1 line connected to the WAN port, continue with step 2.

2. Perform a local T1 signal loopback toward the CPE, and see if the CGA alarm clears after about 10 to 30 seconds. If it does, the WAN port is good; go to step 3. Otherwise, go to step 4.

3. Check the local network equipment receiver, cabling to the Interface port at the local system, and the far-end system or network transmitter.

4. Replace the WAN port with an identical WAN port. Be sure to install the same types of plug-in modules on the new WAN port before plugging it in.

5. If the WAN port is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

5.6 WAN port Specifications

WAN ports	
Physical	
Performance and Test Options	
Loopbacks	Line, Local, Loopback Generation and Detection, (ESF only)
T1	National Bit Supporting (G.704)

T1 Interface	
Bit Rate and Tolerance	1.544 Mbps ± 32 ppm
Number of T1 WAN ports	4
Electrical Interface	Per ANSI T1.102/T1.403, DSX-1 1001/2 balanced
Line Coding	Software selectable AMI or B8ZS
Frame Format	Software selectable D4 or ESF
D4 Framing	Normal Superframe
ESF Framing	Extended Superframe
Voice Channel Signaling	AT&T PUB 43801, AT&T 62411, ITU-T Q.421, Q.422 using robbed-bit method.
Error Detection	
Frame Format	Error Scheme
ESF	CRC-6, Controlled Slip, Out of Frame
D4	BiPolar Violation, Controlled Slip, Out of Frame
Alarm Indication	As per Bellcore TR-TSY-000191
Line Length	Software Slectable: Adjustable line build out (LBO) settings for 110, 220, 330, 440, 550, 660 feet and 0dB, 7.5dB, 15dB and 22.5dB
Power Levels	Complies with ANSI T1.403 and ITU-T G.703
Output Jitter	Complies with ITU-T G.824
Input Jitter and Wander	Complies with ITU-T G.824

Standards Compatibility		
AT&T	TR43801	Digital Channel Bank Requirements and Objectives
	TR54016	Requirements for Interfacing Digital Terminal Equipment to Service Employing the Extended Superframe Format
	TR62411	Accunet 1.5 Service, Description and Interface Specifications
Bellcore	TR-TSY-000008	Digital Interface Between the SLC 96 Digital Loop Carrier System and a Local Digital Switch (Issue 2 08/87)
	TR-TSY-000191	Alarm Indication Signal, Requirements and Objectives
	GR-63-CORE Issue 1	Network Equipment-Building System (NEBS) Requirements: Physical Protection
ANSI	T1.101	Synchronization Interface Standards for Digital Networks
	T1.107	Digital Hierarchy - Formats Specifications
	T1.403	ISDN, Network-to-Customer Installation -DS1 Metallic I/F
	T1.408	ISDN Primary Rate
ITU-T	G.703	Physical/Electrical Characteristics of Hierarchical Digital I/F
	G.704	Synchronous Frame Structure Used At Primary and Secondary Hierarchical Levels
	G.732	Characteristics Of Primary PCM Multiplexed Equipment Operating at 2048 Kbit/sec.

	G.735	Characteristics Of Primary PCM Multiplexed Equipment Operating at 2048 Kbit/sec. and Offering Synchronous Digital Access at 384 Kbit/sec. and/or 64 Kbit/sec.
	G.736	Characteristics of A Synchronous Digital Multiplex Equipment at 2048 Kbits/sec.
	G.823	The Control of Jitter and Wander Within Digital Networks which are based on the 2048 Kbits/sec Hierarchy.
	G.824	The Control of Jitter and Wander Digital which are based on the 1544 Kbits/sec Hierarchy.
	Q.421	Digital line signaling code
	Q.422	Clauses for exchange line signaling equipment
UL/CSA	UL 60950	UL Standard for Safety of Information Technology Equipment
	C22.2, No. 950	Safety of information technology equipment including electrical business equipment.
CEN	EN 50 081-1	Electromagnetic compatibility generic emission Part 1 Residential, commercial and light industry.
	EN 50 082-1	Electromagnetic compatibility generic immunity standard Part 1 Residential, commercial and light industry.
	EN 60 950/A2	Safety of information technology equipment including electrical business equipment.

Chapter 6
FXS Ports

6.1 Introduction

This chapter provides connector pinout, configuration, and troubleshooting information for the Foreign Exchange - Station (FXS) Voice port. This port is labeled Voice. See Appendix C for pinouts of this connector.

This port manages the flow of FXS voice traffic over the network. Each port encodes analog (voice, VF) signals to a digital bitstream at the local system for transmission over a T1 network. It also decodes the digital signals to analog at the remote system.

Each of the four FXS ports have two-wire interfaces that support FXS. FXS allows users to connect the system to a two-way (both inbound and outbound calls) PBX trunk or a key system trunk. All the ports are pre-set to use the loop-start function with POTS stations and simple PBX trunks.

6.2 FXS Descriptions

6.2.1 IMACS-200-FXS Description

The IMACS-200-FXS port has four ports and provides a 600-ohm terminating impedance on each port. All FXS features are supported by the IMACS-200.

6.3 FXS User Screens and Settings

6.3.1 FXS Main Screen

You must configure the FXS ports for operation. This is done from the FXS Main Screen (see Figure 6-1). To go to that screen, highlight the desired port in the System Main Screen and press <Enter>. This screen shows one configuration column for each port on the port.

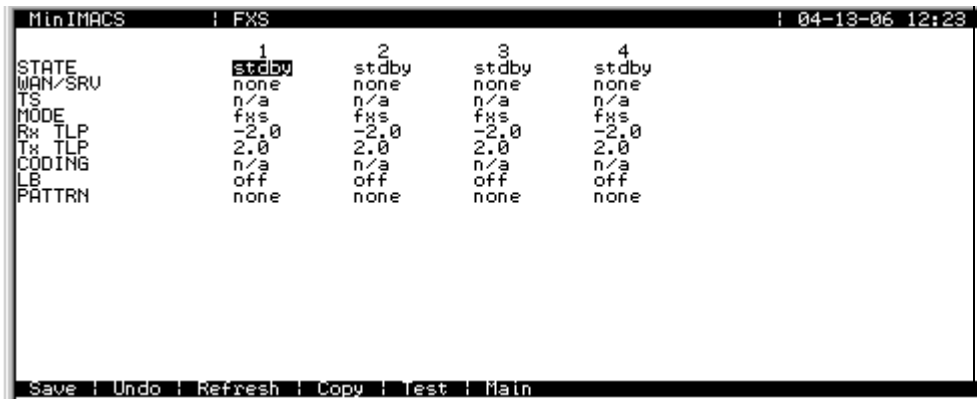

MinIMACS ¦ FXS ¦ 04-13-06 12:23
1 2 3 4
STATE stdby stdby stdby stdby
WAN/SRV none none none none
TS n/a n/a n/a n/a
MODE fxs fxs fxs fxs
Rx TLP -2.0 -2.0 -2.0 -2.0
Tx TLP 2.0 2.0 2.0 2.0
CODING n/a n/a n/a n/a
LB off off off off
PATTRN none none none none
Save ¦ Undo ¦ Refresh ¦ Copy ¦ Test ¦ Main

Figure 6-1. Typical FXS port Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase letter key. Table 7-1 summarizes these actions. For example, after you configure the FXS port ports, press "**s**" to save your settings.

Table 7-1summarizes the configuration settings for the FXS ports, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 6-1. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN/SRV	none wan		none
TS	01-24		01
MODE	fxs		fxs
Rx TLP	-9.0 dB to +3.0 dB		-2.0
Tx TLP	-9.0 dB to +3.0 dB		2.0
CODING	u-law a-law		u-law
LB	off dgtl anlg		off
PATTERN	none D-mW		none

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the State setting to **stdby** (standby) for ports that are not to be used or that have not yet been configured. Set it to **actv** (active) for ports that are ready for use.

WAN

The WAN setting identifies the WAN link assigned to this port. If you choose **wan**, you also must select the desired port (w1-1 through w1-4) of a WAN port for transmission over a T1 link.

It is not necessary to assign all ports of the same FXS port to the same WAN link, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1** to **24** for T1 links. For a display of the available time slots, refer to the cross-connect map for the WAN link; see Chapter 4, *System Configuration and Operation* in the System Reference Guide for information about viewing cross-connect maps.

CAUTION!

Before activating this port, verify the behavior expected by both the station equipment and remote central office equipment, and be sure the systems are properly configured.

MODE

The Mode setting should be determined by the type of equipment to which the user is connecting the port. Currently the only allowable option uses two-wire balanced connections. The **fxs** (Foreign Exchange Station) option allows users to connect the system to a two-way (both inbound and outbound calls) PBX trunk or a key system trunk. The system requires a ringing generator for this option.

Rx TLP

The Receive Transmission Level Point (TLP) setting controls the amount of gain or loss added to the incoming signal after it is decoded to analog. To increase the signal level, set the Rx TLP setting to a positive value (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative value (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to **+2 dB**. The Rx TLP range is **-9.0 dB** to **+3.0 dB**.

Tx TLP

The Transmit TLP setting controls the amount of gain or loss added to a voice signal from the CPE before it is encoded to digital PCM. To increase the signal level, set the Tx TLP setting to a negative value (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive value (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting the Tx TLP to **-3 dB**. The Tx TLP range is **-3.0 dB** to **+9.0 dB**.

CODING

The Coding setting sets the PCM companding method used for a port. Generally, the North American T1 environment uses **u-law** coding. This parameter will impact all four FXS ports. The default coding setting is determined by the type of associated WAN port.

LB

The Loopback field lets you loop the port back toward the network and far end. The **dgtl** (digital) loopback sends the incoming digital DS0 signal back to the far end without decoding it. The **anlg** (analog) loopback sends the decoded analog signal back to the far end after decoding and then re-encoding it. Figure 6-2 shows the loopback options, which allow you to test and troubleshoot the FXS port. To disable a loopback, set this field to **off**.

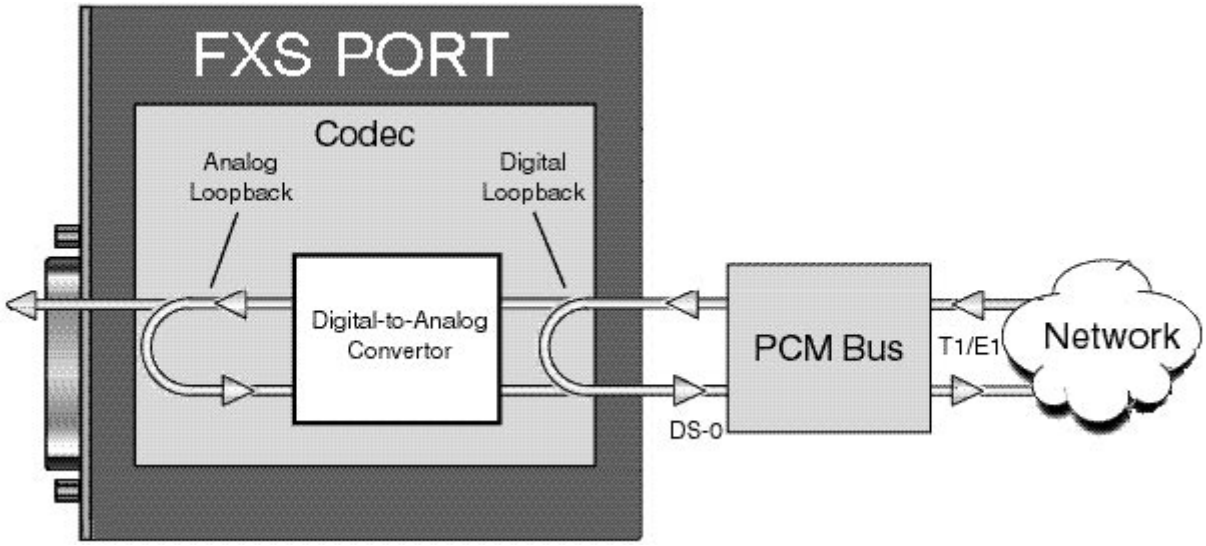


Figure 6-2. FXS port Loopbacks

PATTRN

The Pattern field selects an outgoing test pattern for the current port. The test pattern is generated by the system and sent to the selected port. You can select a different pattern for each port. The **none** option disables the test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The setting of the Rx TLP setting affects the D-mW signal level.

6.3.2 Test Screen

The Test option facilitates testing and maintenance by allowing you to monitor and set the status of the analog interface leads, and to monitor or set the value of the A, B, C, and D signaling bits of all FXS circuits on that port. In cross-connect systems, the test option also allows you to apply test patterns and tones towards the user and network sides of the system.

Figure 6-3 shows the FXS port Test Screen parameters,Table 6-2 lists some actions you can perform from this screen, and Table 6-3 shows the settings for each parameter.

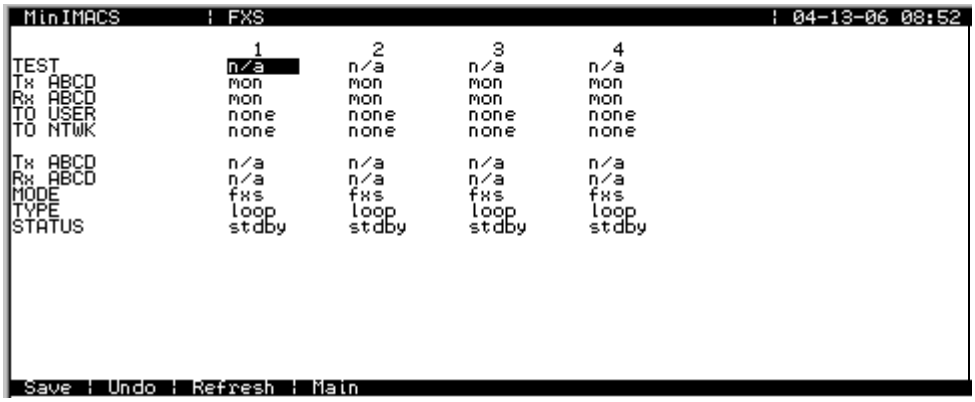

MiniMACS ¦ FXS ¦ 04-13-06 08:52
1 2 3 4
TEST n/a n/a n/a n/a
Tx ABCD mon mon mon mon
Rx ABCD mon mon mon mon
TO USER none none none none
TO NTWK none none none none
Tx ABCD n/a n/a n/a n/a
Rx ABCD n/a n/a n/a n/a
MODE fxs fxs fxs fxs
TYPE loop loop loop loop
STATUS stdby stdby stdby stdby
Save ¦ Undo ¦ Refresh ¦ Main

Figure 6-3. Typical FXS port Test Screen

Table 6-2. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Main	Returns to the FXS port Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 6-3. Test Screen Option Settings and Defaults

Parameter	User Options	Default
TEST	off on	off
Tx ABCD	mon set	mon
Rx ABCD	mon set	mon
TO USER	none D-mW	none
TO NTWK	none D-mW	none
Tx ABCD	Status information only; not editable	n/a
Rx ABCD	Status information only; not editable	n/a
MODE	Status information only; not editable	n/a
TYPE	Status information only; not editable	n/a
STATUS	Status information only; not editable	n/a

TEST

The Test parameter shows if the port is in test mode or not. Inactive ports and ports that are assigned to inactive WANs will show a test status of **n/a**. The test status options for active ports are **off** and **on**.

Tx ABCD

The Transmit ABCD setting allows the user to either monitor the status of the ABCD signaling bits being transmitted towards the network or set a specific ABCD pattern for testing the transmit side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for users to input the ABCD pattern they want to transmit. Any four-digit combination of ones and zeros is acceptable for this setting.

Rx ABCD

The Receive ABCD setting allows the user to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for users to input the ABCD pattern they want to receive. Any four digit combination of ones and zeros is acceptable.

TO USER

In cross-connect systems only, the To User parameter allows you to break the circuit and send a test tone on the user side of the system. The options for this field are **none,** and **D-mW**. Choose **none** if you do not want to inject a tone toward the CPE. In this case, the PCM signal received from the network is still sent to the CPE in the normal manner.

TO NTWK

In cross-connect systems only, the To Network parameter allows you to break the circuit and send a test tone on the network side of the system. The options for this field are **none,** and **D-mW**. Choose **none** if you do not want to inject a tone toward the network. In this case, the PCM signal received from the CPE is still sent to the network in the normal manner.

Tx ABCD

The Transmit ABCD informational field shows the current values of the ABCD bits that are being transmitted to the network. If TX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

Rx ABCD

The Receive ABCD informational field shows the current values of the ABCD signaling bits that are received from the network. If RX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

MODE

The Mode informational field shows the current mode of the port that was selected on the main FXS port Screen. Valid settings are **fxs**.

TYPE

The Type informational field shows the current status of the signal field selected on the main FXS port screen for this port. Valid settings for **fxs** and **wink** modes is **loop** (loop start).

STATUS

The Status field shows the current status of the port. Table 6-4 lists and describes all of the possible conditions reported by this field.

Table 6-4. Status Information Field Settings

Setting	Meaning
stdby	The FXS port is in standby.
W stb	WAN port to which the FXS port is assigned is in standby.
W tst	WAN port to which the FXS port is assigned is under test.
W OOS	WAN port to which the FXS port is assigned is out of service.

noWAN	There is no WAN port configured in the slot to which the FXS port is assigned.
call	Call set-up is in progress.
busy	Call is in progress.
idle	No call is in progress (port is available for a call).
TC	The port is in Trunk Conditioning because a CGA alarm occurred on the associated WAN port.
test	A test is in progress on the port (i.e., you are actively controlling the circuit by setting values for Tx ABCD or Rx ABCD).
maint	The port is in a maintenance condition.

6.4 FXS Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this port.

6.5 FXS port Troubleshooting

The FXS port may be faulty if a voice signal is not received at one end of a circuit, or if signaling is not detected. The following are possible causes:

- Faulty receiving CPE at the near end (where the problem was first noticed)
- Faulty transmitting CPE at the far (opposite) end
- Faulty cabling between the CPE and FXS port at the near end
- Faulty cabling between the CPE and FXS or FXO port at the far end
- T1 network failure
- Improper port configuration at either end (e.g., time slot and/or WAN port assignments)

First, verify that the T1 network has not failed. Check for a CGA-Red alarm on the associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA indicates that the incoming network signal was lost (or that the receiving WAN port is out of frame). During the CGA, all voice ports with time slots on that WAN port will also be disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the associated FXS and FXO voice ports at both ends, as previously outlined in this chapter. In a point-to-point network, the near-end and far-end FX port ports should both be assigned the same WAN port and time slot number. Also make sure the other parameters (such as the transmit and receive TLPs) are set properly at both ends.

If the FX port parameters are correct at both ends, and if the network is okay, the trouble is isolated to the FXS port or the associated port. Proceed as follows:

1. At the far end, activate an analog loopback on the FX port.

2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will be substituted for the normal signal coming from the far-end CPE; it will be sent back to the CPE at your end via the loopback path.

3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end FX port is probably faulty. Disable the loopback and test signal there, and fix the problem. If you still don’t receive a signal, go to step 4.

4. At your end, go to the FXS port Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the FXS port to your CPE, and check the CPE itself. If those items are okay, replace the FXS port at your end.

5. If the FXS port is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

6.6 FXS port Specifications

FXS ports IMACS-200-FXS	
Number of Ports	
IMACS-200-FXS	4 ports
Physical Interface	
Connector	1 female 50-pin telco connector
Transmission Performance	
Performance	Exceeds requirements of ITU-T Rec. G.713
Signaling Modes	
Signaling Modes	Foreign Exchange Station (FXS) Loop Start
Termination Impedance	
IMACS-200-FXS	600 Ohms with 2.16 µF
VF Transmission Characteristics	
Nominal Transmit TLP	Defaults to +2.0 dB. Can be set from -9.0 dB to +3.0 dB
Nominal Receive TLP	Defaults to -2.0 dB. Can be set from -9.0 dB to +3.0 dB
PCM Encoding	Software selectable on a per port basis

Attenuation Versus Frequency Relative to 1 kHz with 0 dBm0 input

Frequency	**Transmit (A to D)**	**Receive (D to A)**
200 Hz	-0.25 to +3.0 dB	-0.25 to +2.0 dB
300 to 3000 Hz	-0.25 to +0.5 dB	-0.25 to +0.5 dB
3200 Hz	0.25 to +0.75 dB	-0.25 to +0.75 dB
3400 Hz	-0.25 to +1.5 dB	-0.25 to +1.5 dB

Return Loss (at 1 kHz)	≥28 dB
Transhybrid Loss	34dB
Idle Channel Noise (rcv and xmt)	< -65 dBm0p Typ < -70 dBmop or < 20 dBrnc0
Interchannel Crosstalk	Typ < -75 dBm0 using 7 adjacent channels being disturbed with a signal of 0.0 dBm0

Total Distortion including Quantization (Signal to Distortion Ratio) Input Frequencies 1004-1020 Hz

Input Level	**Rcv or Xmt**	**Overall**
-30 to 0 dBm0	≥35 dB	≥33 dB
-40 dBm0	≥29 dB	≥27 dB
-45 dBm0	≥25dB	≥22 dB

Absolute group delay	< 750 microseconds
Group Delay Distortion vs. frequency	within boundaries of ITU-T Rec. G.713 Figure 2
Longitudinal Balance	Nom > 46 dB Typ > 50 dB
Variation of Gain with Input Level	within boundaries of ITU-T Rec. G.713 Figure 7

Chapter 7
E&M Ports

7.1 Introduction

This chapter provides connector pinouts, configuration, and troubleshooting information for the E&M Voice Circuits.

The E&M ports manage the flow of toll-grade voice traffic through the IMACS-200 system. Each port encodes an analog (voice, VF) signal to a digital bitstream at the local integrated access system for transmission over a T1 network. Each port also decodes the digital signal to analog at the remote system. The E&M ports support Transmit Only (TO) in the initial release.

Each port connects to a CPE voice circuits from a PBX or other user facility. On this, the initial release of the IMACS-200, Transmission-Only is the only supported mode.

7.2 E&M Description

7.2.1 IMACS-200 E&M Description

The IMACS-200 E&M ports provide an extended transmit TLP range (-16.3dB to + 7.5) for dedicated 4-wire modem applications. This range is required for data speeds of 19.2 kbps and higher.

7.3 E&M port User Screens and Settings

7.3.1 E&M port Main Screen

You must configure the E&M port for operation after installing it in the system chassis. This is done from the E&M Main port Screen, which is shown in Figure 7-1. To go to that screen, highlight the desired port on the System Main Screen, then press <Enter>. The E&M port Main Screen shows four columns of settings, one for each of the E&M ports.

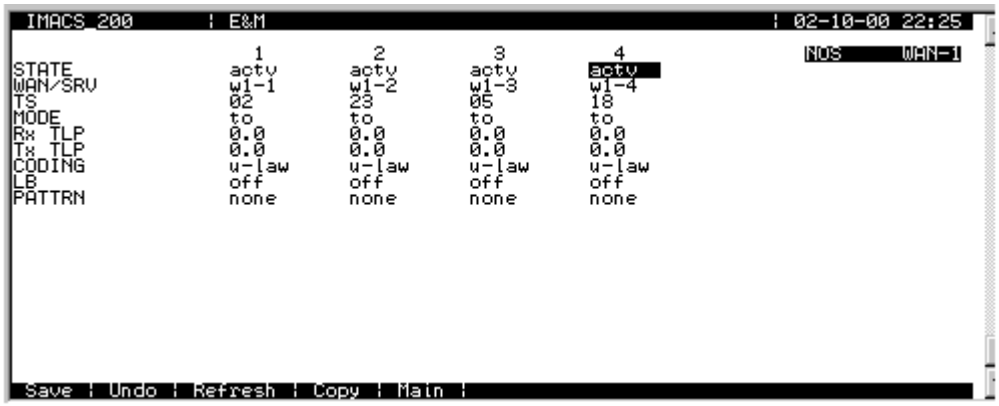

IMACS_200 ¦ E&M ¦ 02-10-00 22:25
NOS WAN-1
1 2 3 4
STATE actv actv actv actv
WAN/SRV w1-1 w1-2 w1-3 w1-4
TS 02 23 05 18
MODE to to to to
Rx TLP 0.0 0.0 0.0 0.0
Tx TLP 0.0 0.0 0.0 0.0
CODING u-law u-law u-law u-law
LB off off off off
PATTRN none none none none
Save ¦ Undo ¦ Refresh ¦ Copy ¦ Main ¦

Figure 7-1.Typical E&M port Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase letter key. Table 7-1 on page 3 summarizes these actions. For example, after you configure the E&M port ports, press "**s"** to save your settings.

Table 7-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and wants to repeat those changes in subsequent columns.
Main	Returns to the System Main Screen. If you make changes to settings and do not save them, you will be prompted to save or lose changes.

Table 7-2, “Main Screen Option Settings and Defaults,” on page 7-3 summarizes the configuration settings for the E&M port, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 7-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN/SRV	none wan	1	none
TS	01-24		01
MODE	to		to
Rx TLP	-16.3 dB to +7.5 dB		0
Tx TLP	-16.3 dB to +7.5 dB	2	0
CODING	u-law a-law		u-law
LB	off dgtl anlg		off
PATTRN	none D-mW		none

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w1-4). See the WAN paragraph that follows.

2. The extended setting range for the IMACS-200 E&M port is from **-16.3** to **+7.5 dB**.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set this field to **stdby** (standby) for ports that will not be used or that are not yet configured. Or, set it to **actv** (active) for ports that are ready for use.

WAN

The WAN setting identifies the WAN link assigned to this port. If you choose **wan**, you also must select the desired port (w1-1 through w1-4) of the WAN for transmission over a T1 link.

It is not necessary to assign all of the E&M ports to the same WAN port, or to contiguous time slots on a WAN port.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. This value is from **1** to **24** for T1 links. For a display of available time slots, refer to the cross-connect map for the WAN link selected.

MODE

The Mode setting specifies whether or not a port uses E&M signaling, or if it operates in the Transmission-Only (TO) mode. Use the **to** mode if you are connecting the port to a four-wire, dedicated-line modem that does not require E&M signaling. For this initial release of the IMACS-200, this is the only mode supported.

Rx TLP

The Receive Transmission Level Point (TLP) setting controls the amount of gain or loss added to a signal after it is decoded to analog. To increase the signal level, set the Rx TLP field to a positive number (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP field to a negative number (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting Rx TLP to **+3 dB**. The Rx TLP range is **-16.3 dB** to **+7.5 dB**.

Tx TLP

The Transmit TLP setting controls the amount of gain or loss added to the voice signal coming in from the local CPE before it is encoded to digital PCM. To increase the incoming signal level, set the Tx TLP field to a negative value (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive number (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -16 dBm can be increased to 0 dBm by setting Tx TLP to **-16 dB**. For the IMACS-200 E&M ports, this range is**-16.5 dB** to **+7.5 dB**.

CODING

The Coding field sets the PCM companding (coding) method used for a port. Changing the coding field will apply the coding type selected to all four ports. Generally, the North American T1 environment uses **u-law** (mu-law) coding. The coding default setting is defined by the type of associated WAN port.

LB

The LB setting allows you to loop a port back toward the network and far end for testing and troubleshooting. Figure 7-2 shows the available loopbacks. The **dgtl** (digital) loopback sends the incoming digital signal from the network back toward the far end, without decoding it. The **anlg** (analog) loopback sends the decoded analog signal back to the far end. To disable either loopback after testing, set this field to **off**.

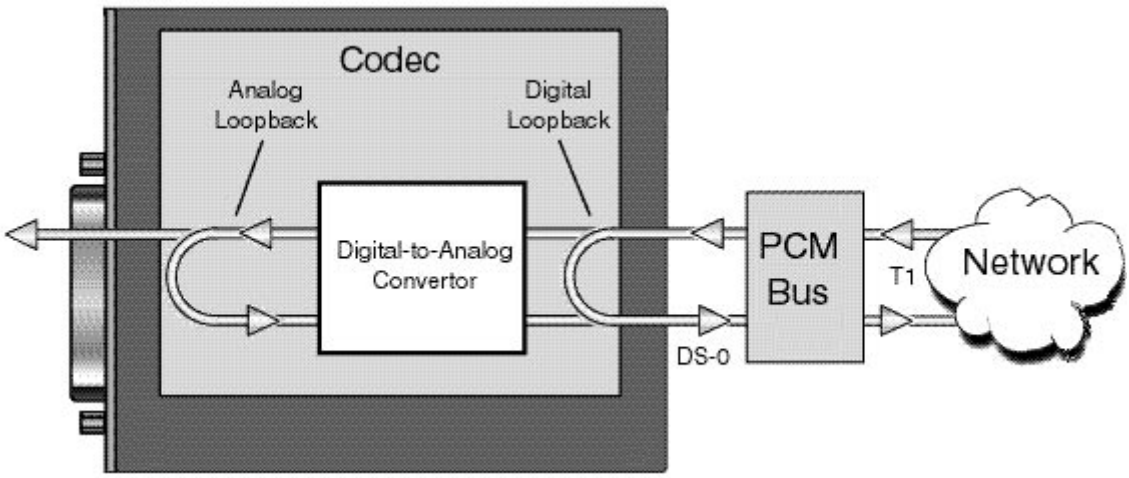


Figure 7-2. E&M port Loopbacks

PATTRN

The Pattern is the outgoing test pattern to be sent to the selected port by the system. You can send a different pattern to each port. The **none** setting disables the test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The setting of the Rx TLP field adjusts the D-mW signal level before sending the signal to the CPE.

7.4 E&M port Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this port.

7.4.1 E&M port Troubleshooting

The E&M port may be faulty if a voice signal is not received at one end of a circuit, or if E&M signaling is not detected. The following are possible causes:

- Faulty receiving CPE at the near end (where the problem was first noticed)
- Faulty transmitting CPE at the far (opposite) end
- Faulty cabling between the CPE and E&M port at either end
- Faulty E&M port at either end
- T1 network failure
- Improper port configuration at either end (e.g., time slot and/or WAN assignments)

First, verify that the T1 network has not failed. Check for a CGA-Red alarm on the associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA indicates that the incoming network signal was lost (or that the receiving WAN port is out of frame). During the CGA, all voice ports with time slots on that WAN port will also be disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the associated E&M voice ports at both ends, as previously outlined in this chapter. In a point-to-point network, the near-end and far-end E&M ports should both be assigned the same WAN port and time slot number. Also make sure the other parameters (such as the transmit and receive TLPs) are set properly at both ends.

If the E&M port parameters are correct at both ends, and if the network is okay, the trouble is isolated to the E&M port or the associated port. Proceed as follows:

1. At the far end, activate an analog loopback on the E&M port.

2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will be substituted for the normal signal coming from the far-end CPE; it will be sent back to the CPE at your end via the loopback path.

3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end E&M port is probably faulty. Disable the loopback and test signal there, and fix the problem. If you still don’t receive a signal, go to step 4.

4. At your end, go to the E&M port's Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the E&M port to your CPE, and check the CPE itself. If those items are okay, replace the E&M port at your end.

5. If the E&M port is determined to be faulty, return the faulty unit for repair to the location specified by your distributor.

7.5 E&M port Specifications

E&M ports 4-Wire	
Physical Interface 4-Wire	
Number of Ports	4
Connectors	4 RJ45 telco connector
Transmission Performance	
Performance	Exceeds requirements of ITU-T G.712 (4-wire))
Signaling	
Signaling Types	Switch selectable - all four ports are the same Normal (toward user) and Trunk/Tandem (toward CO)
Signal Modes	Software selectable per port Transmit Only (to)
VF Transmission Characteristics	
Nominal Transmit TLP	Software selectable -17.5 dB to +7.3 dB in steps of 0.1 dB
Nominal Receive TLP	Software selectable -16.3 dB to +7.5 dB in steps of 0.1 dB
Termination Impedance	with 2.16 µf capacitor in series 600 Ohms
PCM Encoding	Software selectable µ-law A-law

Attenuation Versus Frequency as per AT&T TR43801 - Relative to 1 kHz with 0 dBm0 input

Frequency	**Transmit (A to D)**	**Receive (D to A)**
200 Hz	-0.25 to +3.0 dB	-0.25 to +2.0 dB
300 to 3000 Hz	-0.25 to +0.5 dB	-0.25 to +0.5 dB
3200 Hz	0.25 to +0.75 dB	-0.25 to +0.75 dB
3400 Hz	-0.25 to +1.5 dB	-0.25 to +1.5 dB

Return Loss	Against 600 Ohms, in series with 2.6 µf with additional 25 Ohms resistor between the channel unit and the return loss measurement set.
4-wire	1kHz 28dB min. 300 to 3000 Hz 23dB min.
4W Return Loss (at 1 kHz)	>20dB Typ > 27dB
Relative Transhybrid Loss	Against 600 Ohms, in series with 2.16 µf termination.
Idle Channel Noise (rcv and xmt)	< -65Bm0p. Typically < -70 dBm0p or < 20 dBrnc0 <20dBBrnc0
Interchannel Crosstalk	Typ < -75 dBm0 using 7 adjacent channels being distributed with a signal of 0.0 dBm0.

Total Distortion including Quantization (Signal to Distortion Ratio) Input Frequencies 1004-1020 Hz

Input Level	**Rcv or Xmt**	**Overall**
-30 to 0 dBm0	≥35 dB	≥33.9 dB
-40 dBm0	≥20 dB	≥27.6 dB
-45 dBm0	≥25dB	≥23 dB

Absolute group delay	< 600 microseconds
Group Delay Distortion vs. frequency	within boundaries of ITU-T Rec. G.712 Figure 2
Longitudinal Balance	>46 dB Typ > 50 dB
Variation of Gain with Input Level	within boundaries of ITU-T Rec. G.713 Figure 7 (2 wire) within boundaries of ITU-T Rec. G.712 Figure 7 (4 wire) Typical gain variation is within ± 0.25 dB from +3 to -50 dBm0

Diagnostic Capabilities

Diagnostics	Analog loopback Digital loopback “Make Busy” signaling control

Standards Compatibility

Bell System	TR43801
ITU-T	Recommendations G.711, G.712 and G.714
FCC Rules and Regulations	Part 68, and Part 15 - Subpart J

Chapter 8
SRU Ports

8.1 Introduction

This chapter provides information regarding the configuration and troubleshooting for the Low Delay Subrate Data (LD-SRU) ports.

The SRU ports allow you to connect up to 5 RS-232, low-speed and medium-speed (300 kbps to 38.4 kbps) data terminals to the Integrated Access System. You can multiplex a number of those devices onto a single DS0 time slot of a WAN port. Each port has delay that is a maximum 3ms +/- 10% end-to-end of rates 9.6 kbs or higher for sync, and maximum of 6ms +/-10% end-to-end of rates 9.6 kbs or higher for async.

Each LD-SRU port receives timing from either the external DTE or the Integrated Access System clock. If the DTE supplies the transmit timing, that clock signal must be synchronized to the Integrated Access System's clock source.

Note: *Some changes to SRU ports require that the ports be put in standby then the active modes for the changes to take effect.*

8.2 SRU port User Screens and Settings

You must configure the SRU port for operation before use. This is done from the SRU port Main Screen (Figure 8-1). To go to that screen, highlight the desired port on the System Main Screen and press <Enter>. The SRU port Main Screen has five columns of data for port configuration purposes. The port numbers on the screen correspond to the port faceplate jacks.

IMACS_200 ¦ SRU ¦ 02-11-00 04:34
NOS WAN-1
1 2 3 4 5
STATE actv stdby stdby actv stdby
WAN/SRU w1-4 w1-3 w1-3 w1-3 none
TS 20 20 01 20 n/a
FRAME a a a a a
RATE 38.4 9.6 38.4 38.4 9.6
SR TS 01 01 01 01 01
INTF sync sync sync sync sync
COM CF n/a n/a n/a n/a n/a
CTS perm perm perm perm perm
TX CLK int int int int int
LB off off off off off
LB GEN off off off off off
LB DET w/to w/to w/to w/to w/to
Save ¦ Undo ¦ Refresh ¦ Copy ¦ Test ¦ Main

Figure 8-1. Typical SRU port Main Screen

The highlighted bottom line of this screen shows numerous actions you can perform from this screen. To perform an action, simply press the uppercase key indicated on this line. For example, to save your option settings for this port, press "**s"**. Table 8-1 lists the actions you can perform.

Table 8-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all SRU port ports. Refer to the Test section of this chapter.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 8-2 lists the SRU port Main Screen parameters and available option settings.

Table 8-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby act		stdby
WAN/SRV	none wan (w1-1 through w1-4)		w1-1
TS	01-24		01
FRAME	a b-5	1	a
RATE	.3 1.2 2.4 4.8 9.6 14.4 19.2 28.8 38.4	2	.3
SR TS	n/a 1 1-5		1
INTF	asyn sync		asyn
COM CF	8 7 6 5	3	8
	1 2		1
	none odd even space mark		none
CTS	perm l0 l30 l60 l100 rl0 rl3 rl6 rl10 off		perm
TX CLK	n/a int ext		n/a
LB	off dte net		off
LB GEN	n/a off ocu csu dsu		off

Notes:

1. The only options available for the SRU ports are: **a** and **b-5**.All five ports will use the same Frame Format.

2. Speeds of **0.3**, **1.2,** and **14.4** are not supported for synchronous channels.

3. Communication Configuration is a three step process. This field will show **n/a** when **sync** is chosen as the INTF option.

STATE

The State setting determines whether the port is active or inactive. Set this field to **stdby** (standby) for ports that are not to be used or that have not yet been configured. Set it to **actv** (active) for ports that are ready for use. The control leads assume the status shown in Table 8-3 for the different states.

Table 8-3. SRU port State Status

Control Leads	Active	WAN Link Down	Standby
RLSD	High or follows remote RTS	Low	Low
CTS	Definable	Definable	Low

WAN

The WAN setting identifies the WAN link assigned to this port. It is not necessary for ports on the same port to be assigned to the same WAN link, or to contiguous time slots on a WAN link (see the restriction in the TS field below).

TS

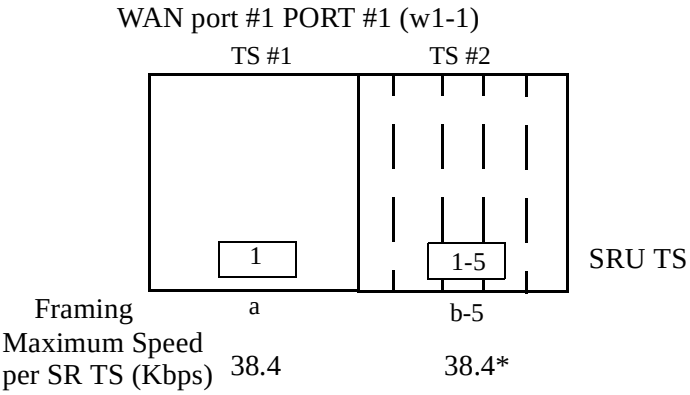
The Time Slot setting identifies the time slot on the WAN link to which this port is connected. Values range from **01** to **24** for T1 links. The SRU port can further subdivide the WAN time slot into smaller segments for transmission of low-speed data. Each WAN time slot can be further divided into a maximum of twenty 2.4 kbps time slots (see Figure 8-2).

FRAME

The Frame setting allows you to define the sub-rate format that the port will use and to set the usable space allotted to each WAN time slot. The choices are DS0A (**a**) for one subrate time slot, DS0B with a limit of five subrate time slots (**b-5**). Note that all five ports will use the same framing mode, whichever the craft person chooses. Figure 8-2 shows the DS0A and DS0B framing subrate time slot interaction.

RATE

The Rate setting allows you to select the rate in kilobits per second (kbps) for data transmission. The selection will change depending upon the framing mode and interface selected. Figure 8-2 shows the bandwidth available for each selection.



*Speeds greater than 9.6Kbps will occupy contiguous SRU Timeslots in 9.6Kbps increments (i.e. a 19.2Kbps circuit would take SRU timeslots #1 and #2)

Figure 8-2. SRU Time Slot Integration

SR TS

The Subrate Time Slot (SR TS) indicates the subrate position within the DS0 time slot the port will occupy (see Figure 8-2). If **a** framing is selected, only one subrate time slot is supported and the SR TS setting will default to 1. If **b-5** framing is selected, the available subrate time slots are 1 to 5. Portions of subrate time slots can be assigned to any SRU port from any SRU port in the system (see the configuration example later in this chapter).

In **b-5** framing, if circuits with speeds greater than 9.6 kbps are assigned to the subrate time slot, adjacent subrate time slots must be available to accommodate their size. A 19.2 kbps circuit would occupy two contiguous subrate time slots (leaving space for up to three 9.6 kbps circuits) and a 38.4 kbps circuit would occupy four contiguous subrate time slots (leaving space for one 9.6 kbps circuit).

The SR TS number selected will be the first segment occupied by this circuit. If a 28.8 kbps circuit occupies three segments of the **b-5** frame, selecting SR TS 1 will assign it to segments 1, 2 and 3. Segments 4 and 5 may be assigned either independently to 9.6 (or less) kbps circuits in SR TS 4 and 5 or combined for a 19.2 kbps circuit assigned to SR TS 4.

If a circuit exceeds the slots necessary to accommodate it, such as a 38.4 kbps circuit to SR TS 3 in **b-5** framing, the message "Invalid SR TS" will be displayed. If a circuit requires more space than the SR TS has available, such as having a 38.4 kbps circuit in SR TS 1 and then attempting to assign a 19.2 kbps circuit to SR TS 4, the message "SR TS overlapping" will be displayed.

INTF

The Interface setting allows you to choose the protocol necessary for the terminal associated with this port. The choices are **asyn** (Asynchronous), and **sync** (Synchronous). If Synchronous transmission is selected, the choices for STOP, DATA and PAR will show as **n/a** (not applicable).

Asyn option provides asynchronous to synchronous conversion. The **asyn** option is a streamlined propriety algorithm which will increase the performance of the port.

COM CF

The Communication Configuration setting is a three-step process that allows you to choose the Data bits, Stop bits, and Parity to be used. The Data setting allows you to change the bits-per-byte number depending upon the type of terminal associated with this particular port. The options are **8**, **7**, **6**, and **5**.

The Stop bits option allows you to select the number of Stop bits that check data sampling for the terminal associated with this port. The options are **1** and **2**.

The third choice is the Parity setting that changes the data parity for the terminal associated with this port. The options are **none**, **odd**, **even**, **space** and **mark**.

CTS

The Clear To Send (CTS) setting allows you to define how the port should respond upon receiving a Request to Send (RTS) from the attached DTE. This setting also allows you to change the delay time (in milliseconds) from when the port receives RTS until it issues CTS. The local option allows RTS to control CTS. The remote-local options allows RTS to control both the CTS of the local equipment and RLSD of the remote equipment. The options are **perm** (permanent), **l0** (local–immediate), **l30** (local - 30 ms), **l60** (local - 60 ms), **l100** (local - 100 ms), **rl0** (remote/local - immediate), **rl3** (remote/local - 30 ms), **rl6** (remote/local - 60 ms), **rl10** (remote/local - 100 ms), and **off**.

TX CLK

The Transmit Clock setting allows you to choose the timing source for this port. The options are **n/a** if **async** interfacing is chosen and **int** (internal), if **sync** interfacing is chosen. The **int** setting uses the Integrated Access System as the clock source, and **ext** allows the DTE to generate transmit timing.

LB

The Loopback setting allows you to activate local loopbacks on the SRU port. These settings are **off**, toward the **dte** (DTE), and toward the **net** (network). Figure 8-3 shows a diagram of the local loopback conditions.

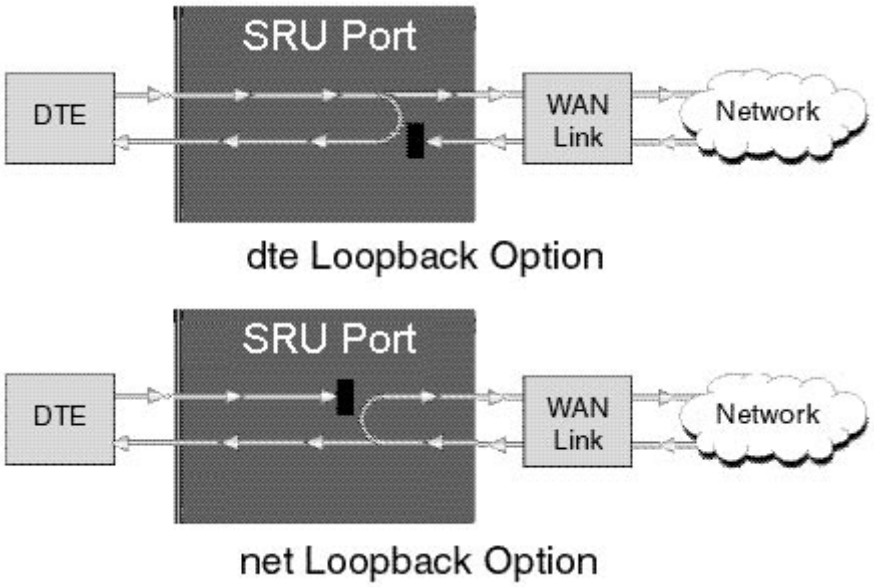


Figure 8-3. Local Loopbacks

LB GEN

The Loopback Generate setting generates inband diagnostic codes that are sent to the remote equipment These codes are compatible with DDS networks, and allow you to command a latching loopback at remote DDS equipment. You can start loopbacks at the remote **ocu** (Office Channel Unit), **dsu** (Data Service Unit), or **csu** (Channel Service Unit). Figure 8-4 through Figure 8-5 show the loopbacks locations. You can also turn each loopback **off**.

Note that loop-up and loop-down commands cannot be implemented for two ports of the same port simultaneously. You must finish all loopback operations on one port before attempting them on another port.

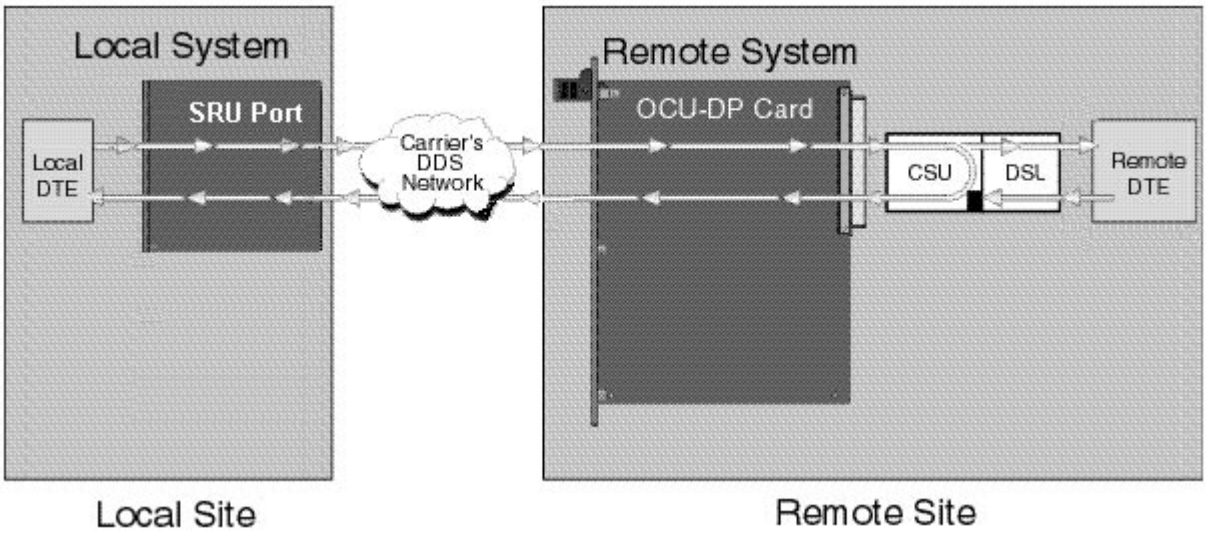


Figure 8-4. Inband Remote SRU Loopback

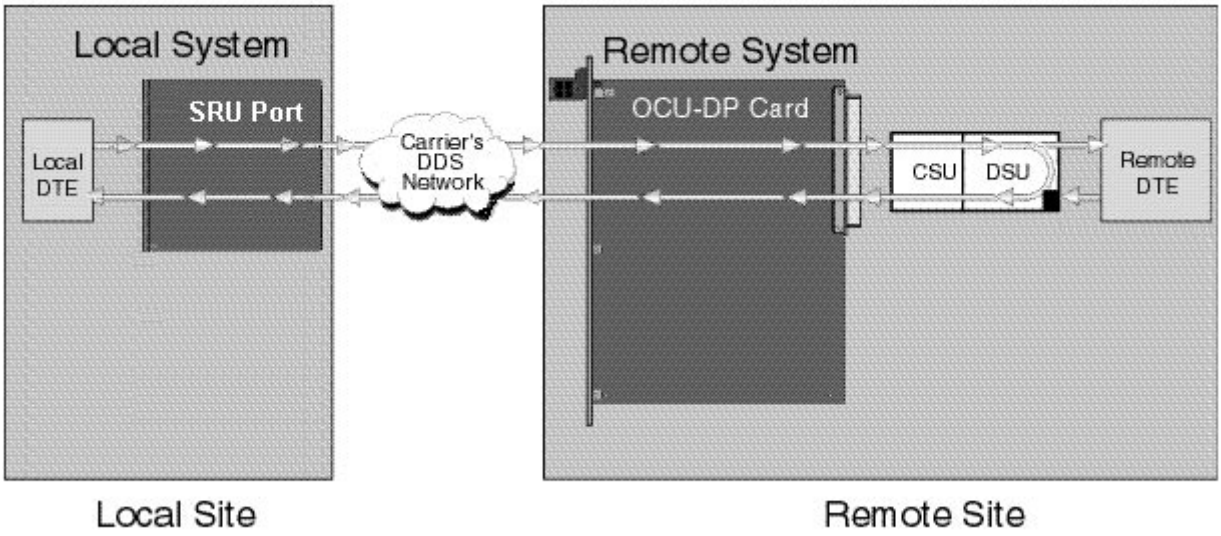


Figure 8-5. Inband Remote DSU Loopback

8.3 Test Screen

Pressing "**t**" (**Test** command) in the SRU port Main Screen will bring up the Test Screen shown in Figure 8-6. From this screen, you can create test situations between SRU ports, or between a single port and data test equipment at a remote site.

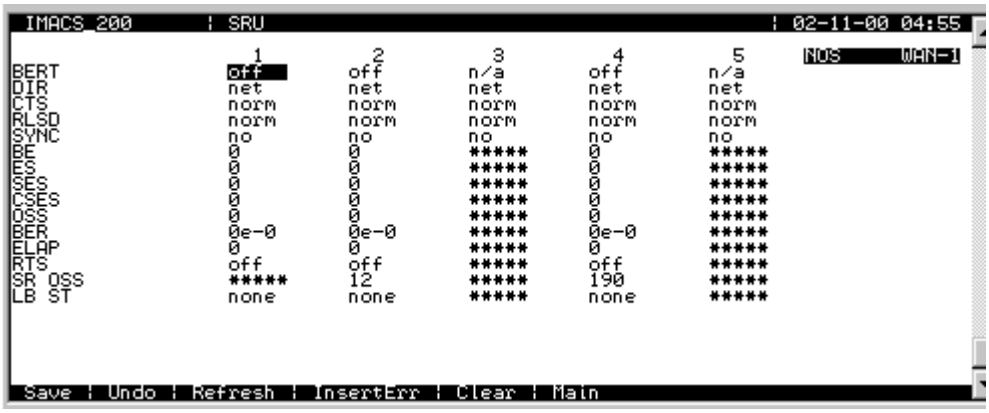

IMACS 200 | SRU | 02-11-00 04:55
NOS WAN-1
1 2 3 4 5
BERT off off n/a off n/a
DIR net net net net net
CTS norm norm norm norm norm
RLSD norm norm norm norm norm
SYNC no no no no no
BE 0 0 ***** 0 *****
ES 0 0 ***** 0 *****
SES 0 0 ***** 0 *****
CSES 0 0 ***** 0 *****
OSS 0 0 ***** 0 *****
BER 0e-0 0e-0 ***** 0e-0 *****
ELAP 0 0 ***** 0 *****
RTS off off ***** off *****
SR OSS ***** 12 ***** 190 *****
LB ST none none ***** none *****
Save | Undo | Refresh | InsertErr | Clear | Main

Figure 8-6. Typical SRU port Test Screen

The bottom highlighted line of the Test Screen shows some actions you can perform from this screen. To perform an action, just press the uppercase key for the desired choice. Table 8-4 lists these actions, and Table 8-5 lists the settings in the Test Screen, along with their possible and default values. These settings are also described in the following paragraphs.

Table 8-4. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
InsertErr	Allows you to manually insert a single error into the clear data signal.
Clear	Clears the Test Screen and resets all counters to zero.
Main	Returns to the SRU port Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 8-5. Test Screen Option Settings and Defaults

Parameter	User Options	Default
BERT	off mark space 1:1 1:7 511 qrss 2047	off
DIR	net user	net
CTS	norm off on	norm
RLSD	norm off on	norm
SYNC	information only–no user options	*****
BE	information only–no user options	*****
ES	information only–no user options	*****
SES	information only–no user options	*****
CSES	information only–no user options	*****
OSS	information only–no user options	*****
BER	information only–no user options	*****
ELAP	information only–no user options	*****
RTS	information only–no user options	*****
SR OSS	information only–no user options	*****
LB ST	information only–no user options	*****

BERT

Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected SRU port. The patterns that can be selected are **off**, **mark** (all ones), **space** (all zeros), **1:1** (alternating 10101010), **1:7** (10000000), **511** (511 test pattern), and **2047** (2047 test pattern).

DIR

The Direction (DIR) setting allows you to specify where the BERT test signal should be directed. The first option is **net** (network) which means that the test signal will be transmitted through the system toward the Wide Area Network (WAN). The **user** option means that the signal will be directed toward the attached DTE device over the RS-232 interface.

CTS

The Clear To Send (CTS) option allows you to define whether the CTS control lead should be held **on** (high) or **off** (low). Selecting either **on** or **off** will override the selection made in the SRU port screen. The third option is **norm** (normal) which means that CTS will behave as described in Table 8-3.

RLSD

The Receive Level Signal Detect (RLSD) option allows you to define whether the RLSD control lead should be held **on** (high) or **off** (low). The third option is **norm** (normal) which means that RLSD will behave as described in Table 8-3.

SYNC

The Synchronization (SYNC) field tells you if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment. Since this is an information-only field, there are no user-selectable parameters.

BE

The Bit Error field shows the total number of bit errors logged. Since this is an information-only field, there are no user-selectable parameters.

ES

The Errored Seconds field shows the total number of seconds in which any errors were detected. Since this is an information-only field, there are no user-selectable parameters.

SES

The Severely Errored Seconds (SES) field shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1×10^{-3}). Since this is an information-only field, there are no user-selectable parameters.

CSES

The Consecutive Severely Errored Seconds (CSES) field is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds. Since this it an information-only field there are no user-selectable parameters.

OSS

The Out of Synchronization Seconds field shows the number of seconds that the SRU BERT has been out of synchronization. Since this is an information-only field, there are no user-selectable parameters.

BER

The Bit Error Rate (BER) field shows the rate at which errors are being logged. The system calculates BER by dividing the number of bit errors (BE) by the total number of bits transmitted during the test. Since this is an information-only field, there are no user-selectable parameters.

ELAP

The Elapsed time setting shows the running tally of the total number of seconds during the test. Since this is an information-only field, there are no user-selectable parameters for this option.

RTS

The Request To Send (RTS) field shows the current status of the RTS control lead. The two values that can be displayed are **on** and **off**. Since this is an information-only field, there are no user-selectable parameters for this option.

SR OSS

The Subrate Out of Synchronization Seconds (SR OSS) field shows how many seconds in which there was a Subrate framing loss. Since this is an information-only field, there are no user-selectable parameters for this option.

LB ST

The Loopback State (LB ST) field indicates whether there are any remotely-initiated loopbacks currently active on the SRU port. This field will display both latching and non-latching loopbacks that are initiated from a remote device via in-band loop-up codes. In addition to **none**, the six possible messages that can be displayed in that field are **l-ocu, l-dsu,** and **l-csu** for latching loopbacks; or **ocu**, **dsu,** and **csu** for non-latching loopbacks. Since this is an information-only field, there are no user-selectable parameters for this option.

8.4 SRU port Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this port.

8.5 SRU port Troubleshooting

SRU port problems could indicate a number of possible causes, including:

- Faulty receiving DTE at the near end (where the problem was first noticed)
- Faulty transmitting DTE at the far (opposite) end
- Faulty cabling between the DTE and SRU port at the near end
- Faulty cabling between the DTE and SRU port at the far end
- T1 network failure
- Improper port configuration at either end (e.g., time slot and/or WAN port assignments)

Typically, a problem is indicated by a loss of incoming signal on a data port at either end of the circuit. You can perform numerous tasks to isolate the trouble and clear it. When troubleshooting transmission problems on a data circuit passing through an SRU port, follow this general sequence:

1. Verify that the T1 network is working properly by checking for current CGA-Red and CGA-Yellow alarms. If the network is faulty, the same transmission problem may exist with the other ports of the same SRU port, and also with the data ports of all other data ports connected to the same T1 line. If no CGA alarms are present, continue with step 2.

2. Verify that the DS0 time slot and sub-rate TS assignments of the faulty port at both ends of the data circuit path are correct. Also be sure the port is connected to the proper WAN port and port and that other critical parameters, such as **RATE**, are set the same at each end. If these assignments are correct, continue with step 4.

3. At the local end (where the incoming data loss was first observed), use the loopback and test signal functions of the SRU port to test the affected port. These tests are accessible from the SRU port Main Screen (through the **LB** and related parameters) and its associated Test Screen (through the **BERT** parameter), as previously described in this chapter. These allow you to test the circuit path in segments and thereby quickly pinpoint the problem.

4. If necessary, also perform loopbacks and send test signals to the affected circuit from the other end. In addition, you can perform end-to-end tests using a suitable data test set at one or both ends of the circuit in conjunction with the loopback functions of the SRU port at either end.

5. If the SRU port is determined to be faulty, the IMACS-200 will need to be replaced or returned for repair to the location specified by your distributor.

8.6 SRU port Specifications

SRU port (Models 822060 and 822160)	
Number of Ports	5
Physical Interface	female 8-pin RJ-48
Electrical Interface	RS232C, ITU-T V.28
Operational Interface	DCE - Full Duplex
Interface Settings	Asynchronous, Synchronous
Sub-rate Framing Format	DS0-A, DS0-B with 5 divisions per DS0
Sub-rate Time slot Number	1 through 5 depending on Sub-rate Framing Format
Synchronous Data	
Format	Transparent
Transmit Clocking	Software selectable per port; internal or external
Speeds	2.4, 4.8, 9.6, 19.2, 28.8 and 38.4 kbps
Asynchronous Data	
Format	Proprietary
Stop Bits	Software selectable per port; 1 or 2
Data Bits	Software selectable per port; 5, 6, 7 or 8
Parity	Software selectable per port; none, odd, even, space or mark
Speeds	.3, 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8 and 38.4 kbps
Signaling	
DSR	Tied to DTR
CTS	Software selectable per port; on, off (tied to RTS)
CTS delay	Software selectable per port; immediate, 30, 60 or 100 ms
RLSD	Software selectable per port; permanently on, follows remote RTS (drop on receipt of IDLE or CGA RED)
Diagnostics & Alarms	
BERT	Integral
Direction	Toward DTE or toward Network
Data Patterns	Off, mark, space, 1:1, 1:7, 511, 2047 zeros
Loopbacks	
Local	Toward DTE or toward Network
Remote - Generation	Inband, latching, DDS format at CSU, DSU or OCU-DP
Remote - Detection	Inband, latching and non-latching DDS Format for OCU Loop, CSU Loop and DSU Loop. Optional automatic ten (10) minute timeout

Standards Compatibility		
Bellcore	GR-63-CORE Issue 1	Network Equipment-Building System (NEBS) Requirements: Physical Protection
AT&T	TR 54075	Subrate Data Multiplexing - A Service of DATAPHONE Digital Service
ITU-T	V.28	Electrical characteristics for unbalanced double-current interchange circuits
	X.50 Division 3	Fundamental Parameters of a Multiplexing Scheme for the International Interface Between Synchronous Data Networks (note: does not support 600 bps data)
	V.14	Transmission of Start-Stop Characters over Synchronous Bearer Channels (using async to sync converters)
EIA	RS 232	Interface Between DTE and DCE Employing Serial Binary Data Interchange
UL	60950	UL Standard for Safety of Information Technology Equipment
CEN	EN 500 081-1	Electromagnetic compatibility generic emission standard Part 1 Residential, commercial and light industry
	EN 500 082-1	Electromagnetic compatibility generic immunity standard Part 1 Residential, commercial and light industry
	EN 50 950/A2	Safety of information technology equipment including electrical business equipment

Chapter 9
HSU Ports

9.1 Introduction

This chapter provides information regarding the configuration and troubleshooting for the IMACS-200 High-Speed Data Ports. The IMACS-200 provides two High-Speed Data ports which connect via an RS-530 interface DB-25 connector, and employ V.35 standard for high-speed synchronous data exchange.

The HSU ports allow you to connect high-speed data terminal equipment (DTE) to WAN links and/or other HSU ports.

9.2 HSU Ports

The IMACS-200 supports two V.35 CPE devices. Each port is configured to operate as a DCE, with data speeds set at either 56 or 64 kbps.

CAUTION!

If used in a system using a T1 “Line Code” other than “B8ZS,” HSU card ports assigned to multirate circuits greater than or equal to 4 or more consecutive time slots at 64kbps must have DTE connected to the port prior to activation. Failure to attach DTE will cause a false carrier alarm.

The IMACS-200 can be used in any DDS application where the circuit has many timeslots (up to 24). The transmit and receive clock edges can be individually selected (refer to Tx and Rx CLOCK PLRTY descriptions later in this chapter).

9.2.1 HSU Port Cables

For connecting HSU Ports for DTE and DCE transmit clocking, use the PRM-1261M cables.

9.3 HSU Card User Screens and Settings

The HSU Cards permit configuration and operation through use of several user screens and optional settings.

9.3.1 HSU Card Main Screen

You must configure the HSU ports for operation. Configuration can be performed from the HSU Main Screen, which is shown in Figure 9-1.

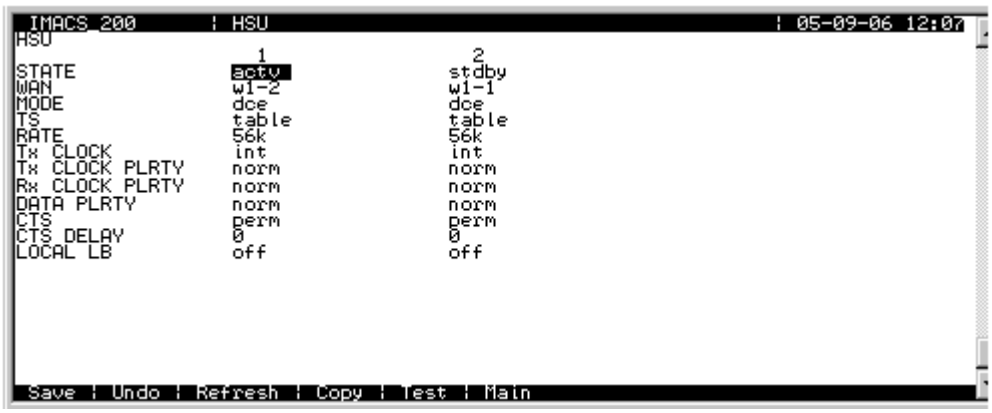

IMACS 200 : HSU : 05-09-06 12:07
HSU
1 2
STATE actv stdby
WAN w1-2 w1-1
MODE dce dce
TS table table
RATE 56k 56k
Tx CLOCK int int
Tx CLOCK PLRTY norm norm
Rx CLOCK PLRTY norm norm
DATA PLRTY norm norm
CTS perm perm
CTS DELAY 0 0
LOCAL LB off off
Save : Undo : Refresh : Copy : Test : Main

Figure 9-1. HSU Main Screen

The bottom highlighted line on this screen lists several actions you can perform from the screen. To perform an operation, simply press the uppercase letter associated with the desired action. For example, to save your option settings, type "**s**". <Xref>Table lists the actions you can perform.

Table 9-1. HSU Card Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., performance and test data).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all HSU Card ports. Refer to the Test section of this chapter.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 9-2. HSU Card Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN	wan		w1-1
MODE	dce		dce
TS	table	1	table
RATE	64k 56k		56k
TX CLOCK	int ext		int
Tx CLOCK PLRTY	norm inv		norm
Rx CLOCK PLRTY	norm inv		norm
DATA PLRTY	norm inv		norm
CTS	perm rlocal ignor local		perm
CTS DELAY	0 30 60 100		0
LOCAL LB	off dte net		off

Notes:

1. The valid range displayed is from **1-24.**

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy time slots on a WAN link. Set State to standby (**stdby**) for ports you are not using or have not yet configured. Set it to active (**actv**) for ports that are ready for use. The control leads assume the status shown in <Xref>Table for the different states.

Table 9-3. HSU Card State Status

Control Leads	Active	WAN Link Down	Standby
RLSD	High or follows remote RTS	Low	Low

DSR	High	High	Low
CTS	Definable	Definable	High

WAN

The WAN setting identifies the WAN port to which the output of this port is directed. I (the options are **w1-1** to **w1-4**).

MODE

The Mode parameter allows you to identify how the HSU port appears to the device on the other end of the interface cable. The **dce** option causes the port to be recognized as a DCE (data circuit-terminating equipment) device. The **dce** option is always chosen in the first offering of the IMACS-200.This allows the end user to connect a **dte** device to the port.

TS

The TS (time slot) setting identifies the time slots on the WAN link when **wan** is the WAN/SRV setting. The HSU ports can use many time slots on a single WAN port to create a super-rate circuit for an individual HSU port. One or all DS0 time slots on a single T1 link can be assembled for use by an HSU port in order to satisfy the speed requirements of the DTE.

The time slot numbers range from **1** to **24**. Figure 9-2 shows the display when **table** is selected. Using the space bar to select and deselect the time slot, this example shows time slots 10 to 12 on WAN 1-1 assigned to this port. The time slot assignments do not have to be contiguous on any card port.

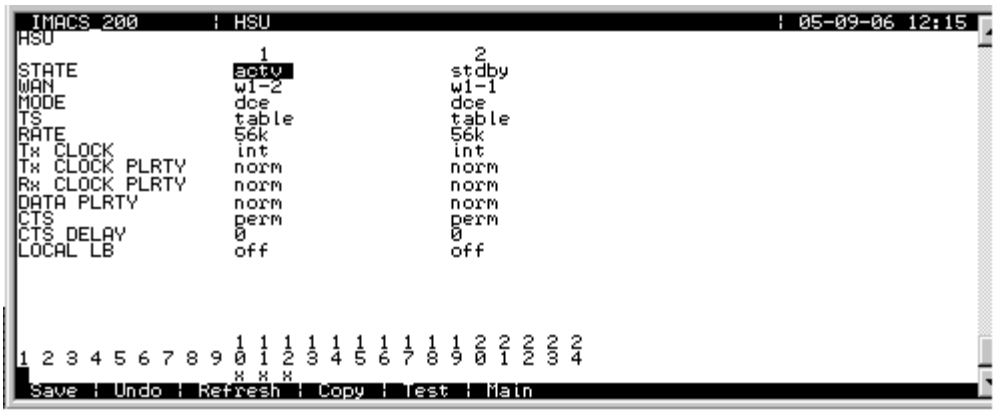

IMACS 200 | HSU | 05-09-06 12:15
HSU
1 2
STATE actv stdby
WAN w1-2 w1-1
MODE dce dce
TS table table
RATE 56k 56k
Tx CLOCK int int
Tx CLOCK PLRTY norm norm
Rx CLOCK PLRTY norm norm
DATA PLRTY norm norm
CTS perm perm
CTS DELAY 0 0
LOCAL LB off off
1 1 1 1 1 1 1 1 1 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
x x x
Save | Undo | Refresh | Copy | Test | Main

Figure 9-2. HSU Port Time Slot Assignment Screen

RATE

The Rate setting allows you to select the bandwidth for all time slots assigned to this port. The available options are **56k** or **64k**. This selection is multiplied by the number of time slots assigned to the port, to define the overall port speed. For example, if you choose **64k** as the port Rate and assign four time slots to that port, the overall port speed is 256 kbps.

Tx CLOCK

The Transmit Clock (Tx CLOCK) setting identifies the clock source for the SD (send data) signal from the external CPE. The **int** (internal) setting requires an external DTE to synchronize its transmitted data with the clock on the SCT leads. The **ext** (extended) setting requires the DTE to synchronize its transmitted data with the clock on the SCTE leads.

Use **ext** with a long cable run to ensure the data and clock are in-phase when they arrive at the system. The DTE must loop back the clock on the SCT leads to the SCTE leads.

If **ext** is selected but the system does not detect an incoming clock on the SCTE leads, the HSU Card automatically generates an internal clock. If this clock is not synchronized with the incoming data, reset the CLOCK PLRTY option to synchronize the clock and data. The Tx CLOCK PLRTY option settings are described in the next paragraphs.

Tx CLOCK PLRTY

The Transmit Clock Polarity (Tx CLOCK PLRTY) setting provides another way to compensate for long cables in those cases where the DTE equipment does not provide SCTE. When you choose **inv** (inverted mode), the relationship between the clock and data is altered to compensate for long cable runs that the data signals must traverse between the card port and CPE. When you choose **norm** (normal), the relationship between the clock and data is unchanged. If you use **inv**, set the Tx CLK (Transmit Clock) option above to **int** (internal).

Rx CLOCK PLRTY

The Receive Clock Polarity (Rx CLOCK PLRTY) setting provides another way to compensate for long cables in those cases where the DTE equipment does not provide SCTE. When you choose **inv** (inverted mode), the relationship between the clock and data is altered to compensate for long cable runs that the data signals must traverse between the card port and CPE. When you choose **norm** (normal), the relationship between the clock and data is unchanged. If you use **inv**, set the Tx CLK (Transmit Clock) option above to **int** (internal).

DATA PLRTY

The Data Polarity (DATA PLRTY) option allows you to either send all data bits to the network as normal ones and zeros, or to invert all bits in the transmitted data stream. Choose **norm** (normal) to leave the transmitted data intact; or, choose **inv** (inverted) to invert all outgoing data. This can be helpful in ensuring minimum-ones density transmission over T1 links when the data contains long strings of zeros. Inverting the zeros reduces the likelihood that the composite T1 stream will not meet minimum-ones density requirements. Both systems of the end-to-end HSD circuit path require the same DATA PLRTY option setting.

CTS

The Clear To Send (CTS) setting controls when data is sent. Some DTE equipment must receive a CTS signal before transmitting data. Set the CTS option to **perm** (permanent) to make CTS permanently High (asserted). Choose **rlocal** (remote-local) to allow RTS to control both CTS on the local DTE device and RLSD on the remote DTE device.

Choose to **ignor** (ignore) to always force CTS Low (negated). Set the CTS option to **locl** (local) to make CTS follow RTS from the local DTE.

CTS DELAY

The Clear To Send (CTS) Delay setting delays changes in the CTS signal in the local mode. Enter the value you need in milliseconds. The available options are **0**, **30**, **60**, and **100** ms. If you do not know what value you need, start with **0** (zero) ms and increase the value gradually until you no longer experience problems. The CTS option above must be set to **locl** before the CTS DELAY setting has any effect.

LOCAL LB

The Local Loopback (LOCAL LB) option activates a loopback on the selected card port. Choose the **dte** setting to loop the outgoing data from the external DTE device back to the DTE receiver. This loopback (see Figure 9-3 on page 9-7) allows you to check the local cabling and most of the circuitry in the HSU port. It also disconnects the incoming data from the far end.

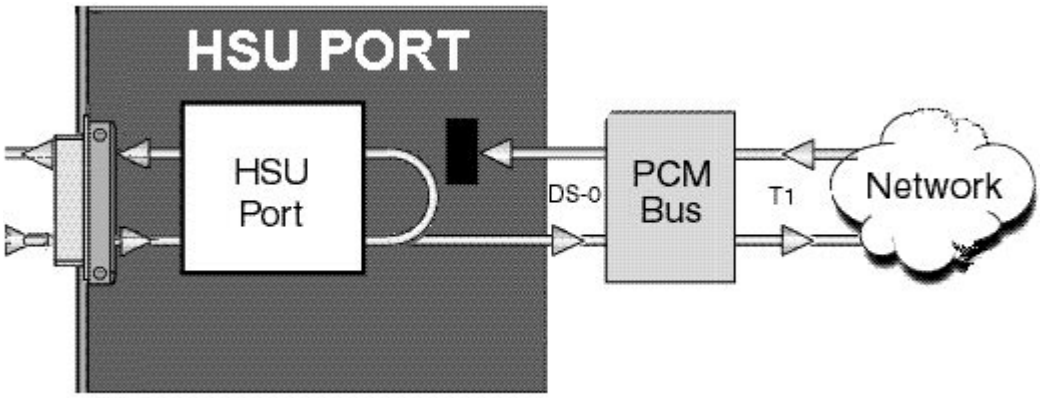


Figure 9-3. Local DTE Loopback

Choose the net (network) setting to loop the incoming data from the network back toward the far end. This loopback is shown in Figure 9-4. It tests some of the local HSU Card circuitry, the local system common cards, the WAN link card, the far-end HSU port and CPE device, and the WAN link between the two sites. The net setting also drops the Data Set Ready (DSR) control signal output on the HSU port.

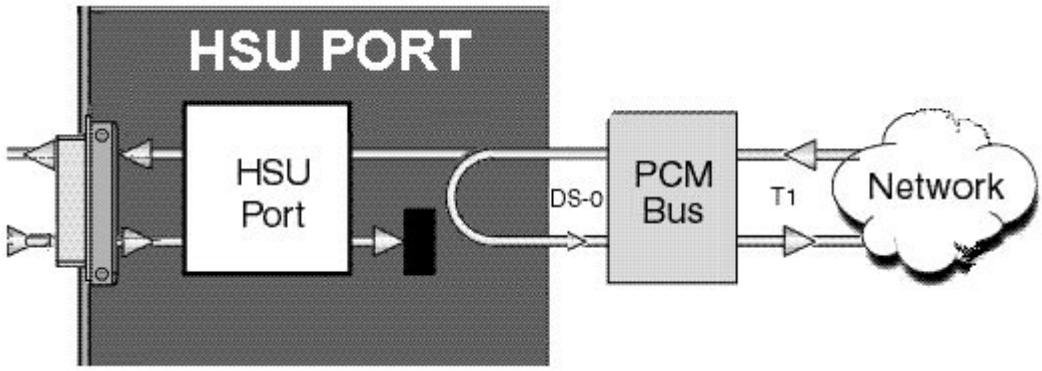


Figure 9-4. Local Network Loopback

9.3.2 HSU Card Test Screen

Selecting “Test” from the HSU Main Screen will access the Test Screen shown in Figure 9-5. From this screen, you can create test situations between HSU ports, or between a single port and test equipment at a remote site. <Xref>Table lists the actions you can perform from the bottom line of this screen, and <Xref>Table lists the settings presented on this screen, along with their possible and default values.

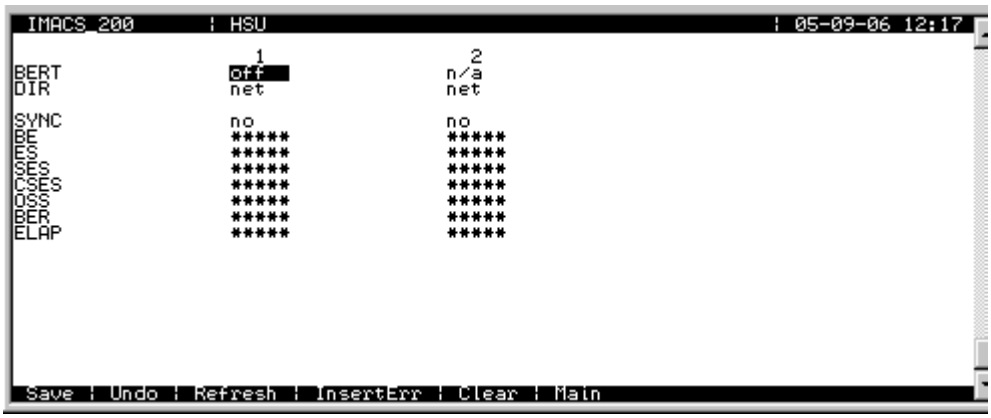


Figure 9-5. HSU Port Test Screen

Table 9-4. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., performance and test data).
InsertErr	Allows you to manually insert a single error into the clear data signal.
Clear	Clears the Test Screen and resets all counters to zero.
Main	Returns to the HSU Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 9-5. Test Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
BERT	off mark space 1:1 1:7 3:24 qrss prb11 prb15 prb20		off
DIR	net user		net
SYNC	information only–no user options		
BE	information only–no user options		
ES	information only–no user options		
SES	information only–no user options		
CSES	information only–no user options		
OSS	information only–no user options		
BER	information only–no user options		
ELAP	information only–no user options		

BERT

The Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected HSU port. The patterns that can be selected are **off**, **mark** (1111), **space** (0000), **1:1** (1010 alternating), **1:7** (0100-0000), **511** (511 test pattern), **qrss** (quasi-random signal source), and **2047** (2047 test pattern).

On the four-port HSU 530/35 Card, selecting the **ds0** pattern will display another set of BERT patterns. Additional non-latching loopback patterns are **ff** (1111-1111), **7e** (0111-1110), **32** (0011-0010), **40** (0100-0000), **ocu-a** (ocu-alternating byte), **csu-a** (csu-alternating byte), **dsu-a** (dsu-alternating byte), **csu1a** (csu–one repeater–alternating byte), and **csu2a** (csu–two repeater–alternating byte). The results of the alternating patterns (**ocu-a**, **csu-a**, **dsu-a**, **csu1a** and **csu2a**) appear in the Test Screen.

Also note that the Bit Error Rate Tester is supported on the HSU-T V11 and HSU-T 35 Cards only if the port mode is set to **dce** in their Card Main Screens.

SYNC

The Synchronization field indicates if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment. This is an information-only field; it is not user-configurable.

BE

The Bit Error (BE) field indicates the total number of bit errors logged. This is an information-only field; it is not user-configurable.

ES

The Errored Seconds (ES) field indicates the total number of seconds in which errors were detected. This is an information-only field; it is not user-configurable.

SES

The Severely Errored Seconds (SES) field indicates the total number of seconds in which the bit error rate exceeded one bit per thousand (1×10^{-3}). This is an information-only field; it is not user-configurable.

CSES

The Consecutive Severely Errored Seconds (CSES) field is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, this field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds. This is an information-only field; it is not user-configurable.

OSS

The Out of Synchronization Seconds (OSS) field indicates the number of seconds that the HSU BERT has been out of synchronization. This is an information-only field; it is not user-configurable.

BER

The Bit Error Rate (BER) field indicates the rate at which errors are being logged. The system calculates BER by dividing the number of bit errors (BE) by the total number of bits transmitted during the test. This is an information-only field; it is not user-configurable.

ELAP

The Elapsed time (ELAP) setting indicates the running tally of the total number of seconds during the test. This is an information-only field; it is not user-configurable.

9.4 HSU Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on HSU Card Error Messages.

9.5 HSU Port Troubleshooting

Problems with an HSU ports could be caused by a number of things. Typically, a problem is indicated by a loss of incoming signal on a data port at either end of the circuit. You can perform numerous tasks to isolate the trouble and clear it. When troubleshooting transmission problems on a data circuit passing through an HSU port, follow this general sequence:

1. First, verify that the T1 network is working properly by checking for current CGA-Red and CGA-Yellow alarms. If the network is faulty, the same transmission problem will exist with the other HSU port, and also with the data ports of all other data cards connected to the same T1 line. If no CGA alarms are present, continue with step 2.

2. If the trouble is only with the current HSU port, continue with step 3.

3. Check the DS0 time slot assignments of the faulty port at both ends of the data circuit path. Also be sure the port is connected to the proper WAN port at each end. If these assignments are correct, continue with step 4.

4. At the local end (where the incoming data loss was first observed), use the loopback and test signal functions of the HSU port to test the affected port. These tests are accessible from the HSU Main Screen and associated Test Screen, as previously described in this chapter. They allow you to test the circuit path in segments and thereby quickly pinpoint the problem.

5. If necessary, also perform loopbacks and send test signals to the affected circuit from the other end. In addition, you can perform end-to-end tests using a suitable data test set at one or both ends of the circuit in conjunction with the loopback functions of the HSU port at either end.

6. Should the HSU port be determined as faulty, return the IMACS-200 for repair to the location specified by your distributor.

9.6 HSU Port Specifications

Number of Data Ports	Physical Interfaces	Electrical Interfaces
2	2 female 25-pin DB25 D-connectors	ITU-T V.35

Data Speeds	N x 56k and N x 64k, where N = 1 to 24 (up to 1536 kbps) - Software Configurable by DS0
Data Format	Synchronous
Data Protocol	Transparent
Transmit Clock per Port	Internal or External (software selectable)
Clock Polarity per Port	Normal or inverted (software selectable)
Data Polarity per Port	Normal or inverted (software selectable)

Diagnostics	
RTS/CTS Delay: per Port	0, 30, 60 or 100 ms (software selectable by port)
RTS Handshake per Port	Permanent, local, ignore, local (software selectable by port)
BER Test per Port	Active or inactive BER Test Patterns All Marks, All Spaces, 1:1, 1:7, QRSS, 511, 2047
Local Loopback per Port	None, towards DTE, towards the network
Performance Statistics	Errored Seconds, Unavailable Second, Severely Errored Second, Burst Errored Second, Loss of Packet Seconds, Loss of Frame Count

Standards Compatibility		
ITU-T	V.35	Data Transmission of 48 kbps using 60-108 kHz Group Bank Circuits.
	V.11 (10/96)	Electrical characteristics for balanced double-current interchange circuits operating at data signaling rates up to 10 Mbit/s.
	V.28	Electrical characteristics for unbalanced double-current interchange circuits.
EIA	Recommendations RS-530	High Speed 25 Position Interface for Data Terminal Equipment, Including Alternative 25 Position Connector.
UL	60-950	UL Standard for Safety of Information Technology Equipment.
CEN	EN 50 082-1	Electromagnetic compatibility generic emission standard Part 1 Residential, commercial and light industry.
	EN 50 082-2	Electromagnetic compatibility generic immunity standard Part 1 Residential, commercial and light industry.
	EN 60 950/A2	Safety of information technology equipment including electrical business equipment.

Chapter 10
OHSU ports

10.1 Introduction

This chapter provides configuration, and troubleshooting information for the optional Optical High-Speed Data Unit (OHSU) ports. These ports are labeled on the rear faceplate as OHSU1 and OHSU2. Connectors above each OHSU port LED indicator are labeled Tx and Rx for the transmit and receive fiber connectors. Each OHSU port allows you to connect to Telephone Protection Equipment (TPE) in compliance with IEEE C37.94.

10.2 OHSU port

10.2.1 Two-Port OHSU port Description

The OHSU port provides two full duplex IEEE C37.94 optical ports for optical serial N times 64 kbps interface capability. Each optical port contains a transmit (Tx) and receive (Rx) connector along with a status LED. The ports shown below in Figure 10-1 show the two ports on the rear of the box, with the dust caps removed from OHSU port 1, ready for optical connectors.

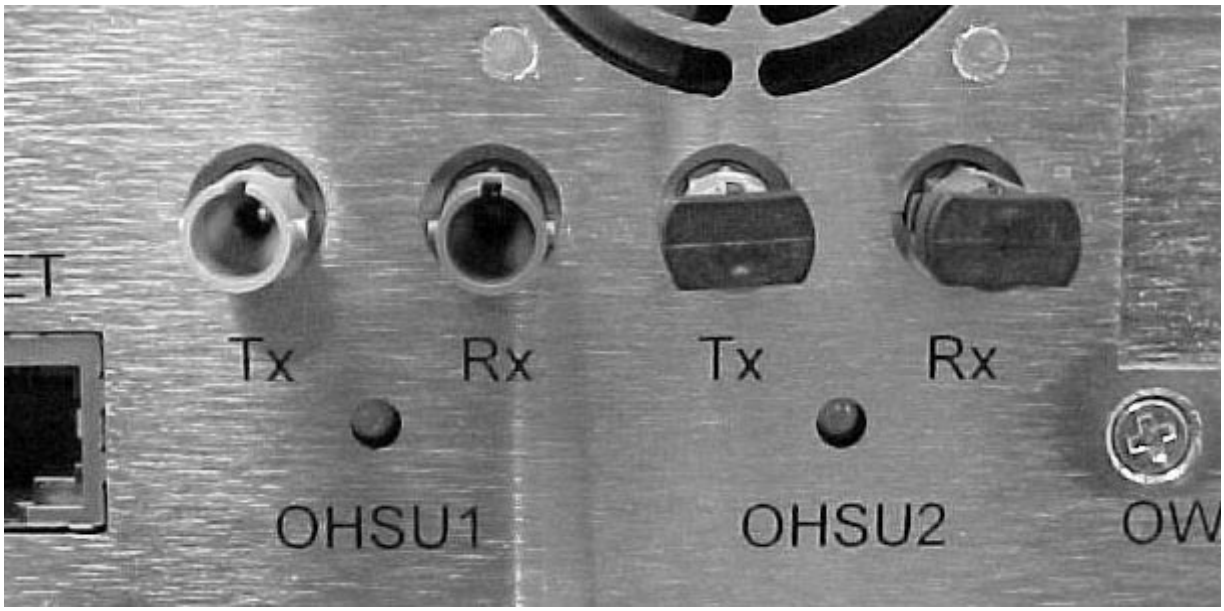


Figure 10-1. Two-Port OHSU port

10.2.2 OHSU port Cables

The OHSU port utilizes 50 um or 62.5 um optical fiber cables with BFOC12.5 (ST) connectors. A separate transmit and receive fiber is required for each port.

10.3 OHSU port User Screens and Settings

The OHSU ports permit configuration and operation through use of several user screens and optional settings.

10.3.1 OHSU port Main Screen

You must configure the OHSU port ports for operation. Configuration can be performed from the OHSU port Main Screen, which is shown in Figure 10-2. To access that screen, highlight the desired port in the System Main Screen and press <Enter>.

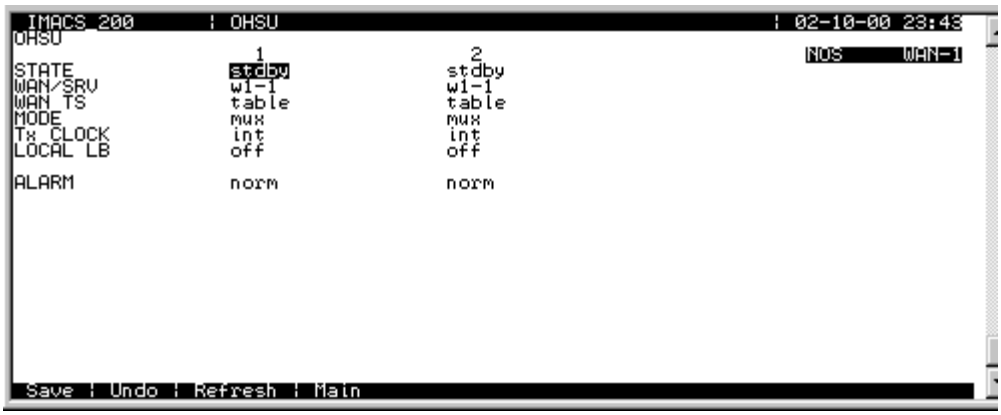


Figure 10-2. Typical OHSU port Main Screen

The bottom highlighted line on this screen lists several actions you can perform from the screen. To perform an operation, simply press the uppercase letter associated with the desired action. For example, to save your option settings, type "**s**". <Xref>Table lists the actions you can perform.

Table 10-1. OHSU port Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., performance and test data).
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 10-2. OHSU port Setting Options and Defaults

Parameter	User Options	Default
STATE	stdby actv	stdby
WAN/SRV	wan (W1-1...W1-4)	none
MODE	mux	mux
TS	table (up to 12 TS)	no assignment
RATE	64k	64k
TX CLOCK	int (mux MODE)	int
LOCAL LB	off user net	off

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy time slots on a WAN link. Set State to standby (**stdby**) for ports you are not using or have not yet configured. Set it to active (**actv**) for ports that are ready for use.

WAN

The WAN setting identifies the port to which the output of this port is directed. The options are **w1-1** to **w1-4**.

MODE

The Mode parameter appears for information only. The OHSU is fixed in the MUX mode.

WAN TS

The TS (time slot) setting identifies the time slots on the WAN link. Unlike other user ports, the OHSU port can use many time slots on a single WAN port to create a super-rate circuit for an individual OHSU port. One to 12 DS0 time slots on a single T1 can be assembled for use by an OHSU port in order to satisfy the speed requirements of the Telephone Protection Device (TPD).

The time slot numbers range from **1** to **24** for T1 links. Figure 10-3 shows the display when **table** is selected. Using the space bar to select and deselect the time slot, this example shows time slots 1 to 5 on WAN 1-1 assigned to port 2. The time slot assignments have to be contiguous on any port.

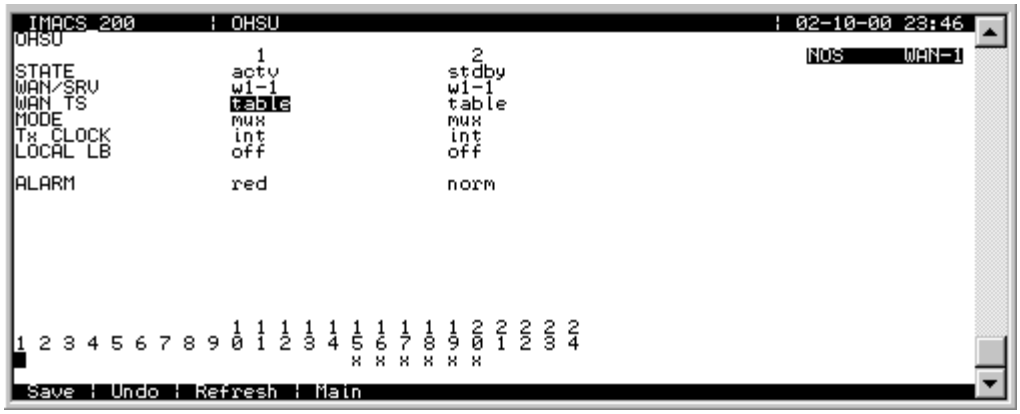

IMACS 200 ¦ OHSU ¦ 02-10-00 23:46
OHSU
NOS WAN-1
1 2
STATE actv stdby
WAN/SRV w1-1 w1-1
WAN_TS table table
MODE mux mux
Tx_CLOCK int int
LOCAL_LB off off
ALARM red norm
1 1 1 1 1 1 1 1 1 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
x x x x x
Save ¦ Undo ¦ Refresh ¦ Main

Figure 10-3. Typical OHSU Port Time Slot Assignment Screen

Tx CLOCK

The OHSU ports behave as IEEE C37.94 MUX ports so the Transmit Clock (Tx CLOCK) setting can only be **int** (internal).

LOCAL LB

The LOCAL Loopback (LOCAL LB) option activates a loopback on the selected port. Choose the **User** setting to loop the outgoing data from the external TPE device back to the TPE receiver. This loopback (see Figure 10-4) allows you to check the local cabling and most of the optical circuitry in the OHSU port. It also disconnects the incoming data from the far end.

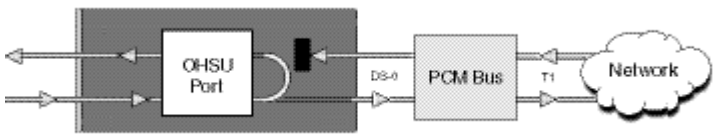


Figure 10-4. Local User Loopback

Choose the **net** (network) setting to loop the incoming data from the network back toward the far end. This loopback is shown in Figure 10-5. It tests some of the local OHSU port circuitry, the local system common ports, the WAN link port, the far-end OHSU port and CPE device, and the WAN link between the two sites.

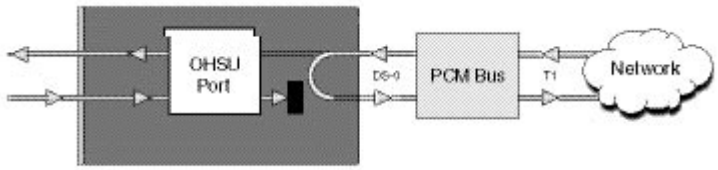


Figure 10-5. Local Network Loopback

Alarm

The alarm field is an indication field that shows the optical link status.

Table 10-3. Alarm Field

Field	Optical Link Status
Norm	The optical link is operating properly.
Yellow	The TPE is reporting a reception fault.
Red	The OHSU port is reporting a reception fault.

10.4 OHSU port Specifications

Number of Data Ports	Physical Interfaces	Optical Interfaces
2	4 ST connectors	IEEE C37.94

Data Speeds	N x 64k, where N = 1 to 12 - Software Configurable
Data Format	Synchronous
Data Protocol	Transparent
Transmit Clock per Port	Internal

Standards Compatibility

IEEE C37.94

Chapter 11
Alarm ports

11.1 Introduction

The IMACS-200 Alarm ports allow the system to report alarms to external alarm annunciators and other systems. Each port also receives alarms reported by external devices. Each port has switches for outbound alarms, and sensors that detect incoming alarms from the external equipment.

The IMACS-200 provides four separate Alarm outputs and four separate alarm inputs. Each one can be individually controlled by the system operator.These ports are discussed in detail below.

Each port has two alarm notification modes. The "Switch/Act On" (outbound) function allows you to report internal system alarms to external devices, such as buzzers, bells, and lights. The "Sensor/Trig On" (inbound) function allows you to receive external alarms through sensors on the port.

11.2 Alarm port User Screens and Settings

11.2.1 Alarm Filter Screen Sensor Setting

First, make sure the master setting for all alarm sensors is set properly as the SENSOR variable in the Alarm Filter Screen. To set this variable, first select **Alarms** from the System Main Screen, then choose **Filters**. This will display a list of alarm filters, as shown in Figure 11-1.

In this menu, use the arrow keys to highlight the first column of the SENSOR line. Pressing <Enter> displays the options **ignore**, **log**, and **report**. The option chosen here will act as the highest-level option for all alarm port sensors. If this variable is set to **ignore**, ***any alarm conditions on the alarm port will be ignored***, even if you set them up individually to **log** or **report**.

Likewise, if you set this variable to **log**, all sensors on the Alarm port that are set to anything other than **ignore** will be logged but not reported. For this reason, it is crucial that the SENSOR variable be set to **report** (see Figure 11-1). The following screen is the default alarm filter settings that are set on the IMACS-200.

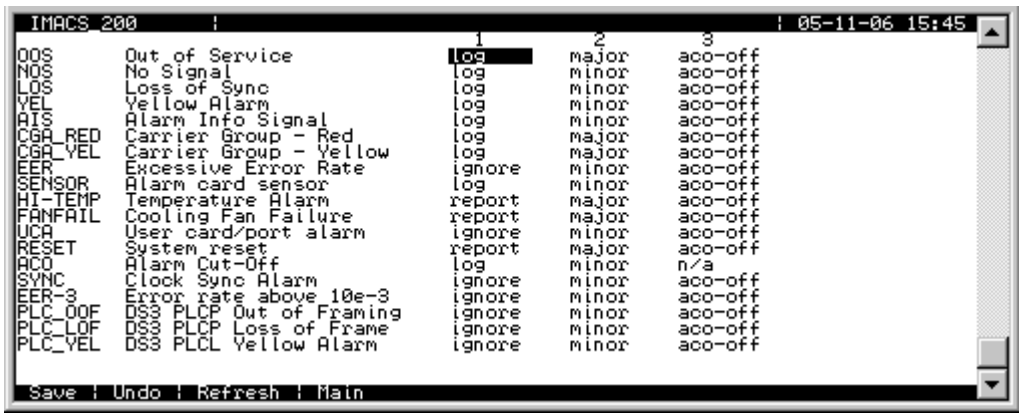

IMACS_200 ¦ ¦ 05-11-06 15:45
1 2 3
OOS Out of Service log major aco-off
NOS No Signal log minor aco-off
LOS Loss of Sync log minor aco-off
YEL Yellow Alarm log minor aco-off
AIS Alarm Info Signal log minor aco-off
CGA_RED Carrier Group - Red log major aco-off
CGA_YEL Carrier Group - Yellow log major aco-off
EER Excessive Error Rate ignore minor aco-off
SENSOR Alarm card sensor log minor aco-off
HI-TEMP Temperature Alarm report major aco-off
FANFAIL Cooling Fan Failure report major aco-off
UCA User card/port alarm ignore minor aco-off
RESET System reset report major aco-off
ACO Alarm Cut-Off log minor n/a
SYNC Clock Sync Alarm ignore minor aco-off
EER-3 Error rate above 10e-3 ignore minor aco-off
PLC_OOF DS3 PLCP Out of Framing ignore minor aco-off
PLC_LOF DS3 PLCP Loss of Frame ignore minor aco-off
PLC_YEL DS3 PLCL Yellow Alarm ignore minor aco-off
Save ¦ Undo ¦ Refresh ¦ Main

Figure 11-1.Alarm Filter Screen

11.2.2 Alarm Contacts Main Screen

Figure 11-2 shows the Alarm level from the Main Screen. To go to this screen, highlight the **ALM** area in the System Main Screen and press <Enter>.

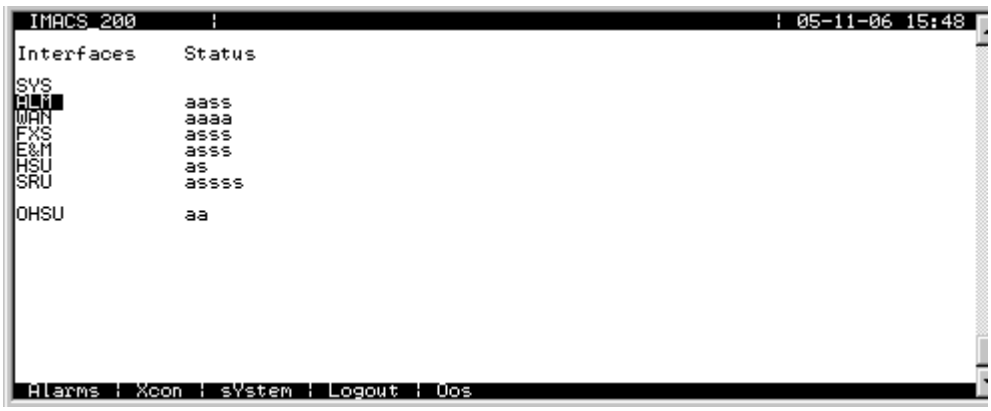


Figure 11-2. Alarm Level from the Main Screen

Figure 11-3 shows the Alarm Contact Main Screen. This screen allows the crafts person to individually set the alarm outputs (**SWITCH**) and the alarm inputs (**SENSOR**).The inputs are received on leads through the 50-pin Amphenol connector. Please refer to Table 2-5 on page 2-8 for the pin-out descriptions. The outputs are transmitted through the RJ45 connector labeled **ALARM** on the rear of the IMAC-200 chassis, along with the Sub Rate Data connectors. Please refer to Table 2-9 on page 2-11 for a description of the output pin-outs.

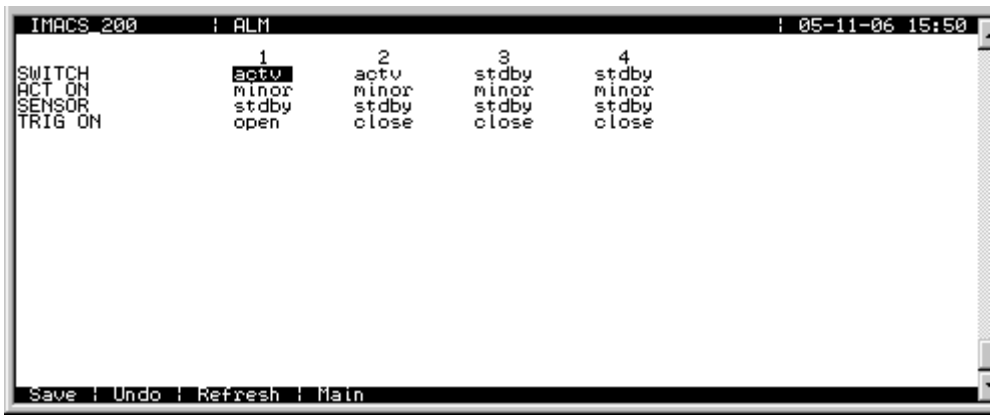

IMACS_200 ¦ ALM ¦ 05-11-06 15:50
1 2 3 4
SWITCH actv actv stdby stdby
ACT ON minor minor minor minor
SENSOR stdby stdby stdby stdby
TRIG ON open close close close
Save ¦ Undo ¦ Refresh ¦ Main

Figure 11-3.Alarm Contact Settings

The bottom highlighted line of the screen shows actions that you can perform from this screen. To perform an action, simply press the uppercase letter on your keyboard that corresponds to the desired action. Table 11-1 lists these actions, and Table 11-1 summarizes the port option settings and default values. Each parameter is also described in the following paragraphs.

Table 11-1. Alarm Contacts Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated on screen (i.e., alarm data).
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 11-2. Alarm Contacts Settings and Defaults

Parameter	User Options	Default
SWITCH	stdby actv	stdby
ACT ON	minor major any	minor
SENSOR	stdby actv	stdby
TRIG ON	close open	close

SWITCH

The Switch setting indicates that the outbound alarm switch is **actv** (on) or **stdby** (off).

ACT ON

The Act On parameter defines the type of system alarm that will cause the switch to trigger. Program each alarm switch to trigger on **minor** (information and minor) alarms, **major** (major and critical) alarms, or **any** alarm message.

SENSOR

The Sensor setting indicates the inbound alarm sensor is **actv** (on) or **stdby** (off).

TRIG ON

The Trigger On parameter defines if the sensor should report an external alarm upon sensing the opening (**open**) or the closure (**close**) of the C-form contact to which it is connected.

11.3 Alarm port Error Messages

Refer to Appendix B in this Guide for further information on Error Messages regarding these ports.

11.4 Alarm port Troubleshooting

Alarm port problems could indicate a number of possible causes. Typically, a problem is indicated by the loss of an incoming alarm signal on a sensor port or the lack of a contact closure/open in response to an internal alarm. Steps designed to isolate the source of the problem and return the port to normal operation are detailed below. When troubleshooting Alarm port problems, you should follow this general sequence:

1. Verify that the Alarm port sensor filter (SENSOR) is set to either **log** or **report** in the Alarm Filters Menu. This menu is accessed by selecting "**A**larms" from the Main Screen (not the Alarm port Screen), and then selecting "**F**ilters." Column 1 lists the filter setting (ignore, log, or report). You can change the filter setting by highlighting the item you wish to change and pressing the <Enter> key. Use the arrow keys to highlight a new filter setting and press the <Enter> key again. If you are satisfied with your selections, remember to "**S**ave" before exiting the screen. If you make any changes and then attempt to exit the screen without saving, you will be prompted "Ok to lose changes (y/n)?" You must select "**y**" or "**n**". If you select "**y**", any changes will be lost and all selections will revert to the last saved state.

2. On the Alarm port menu, verify that the switch/sensor in question is set to active (**actv**). If set correctly and the problem is with a switch (contact), go to step 3. If the problem is with a sensor, go to step 5.

3. Verify that the amphenol cable is connected correctly to the **Voice** port. At a cross-connection point between the Alarm port and the external “scan point”, open the circuit under test. Connect a Volt-Ohmmeter set to read resistance across the Alarm port contact in question. If no alarm of the type (Major, Minor or Any) that the contact is programmed to act upon is present, and it is a normally open (NO) contact, the meter will read infinite resistance. If you are testing a normally closed (NC) contact, the meter will read 0 ohms resistance.

4. Generate an alarm of the type (Major, Minor or Any) that the contact is programmed to act upon. The Volt-Ohmmeter should detect a resistance change from 0 to infinite or infinite to 0, depending on the type of contact (NO or NC). If no change is detected, the switch port may be defective.

5. Verify the RJ45 cable is connected correctly to the **Alarm** port. At a cross-connection point between the Alarm port and the external equipment, open the circuit under test. Connect a short across the Alarm port sensor input in question. A SENSOR alarm should be reported. If no alarm is reported, the sensor port may be defective.

6. If the Alarm port is determined to be faulty, return the faulty unit for repair to the location specified by your distributor.

Chapter 12
System Testing and Diagnostics

12.1 Introduction

This chapter describes the IMACS-200 comprehensive set of built-in diagnostic tools that enable the operator to remotely troubleshoot and resolve problems. Throughout the user port chapters in this system reference guide are brief explanations of system testing and problem solving. However this chapter was designed to provide a “full picture” of what this Integrated Access System is capable of providing.

12.2 Integral Test Capabilities

The Integrated Access System provides diagnostics capabilities to resolve problems. There are system-generated alarm messages described in *Chapter 4. System Configuration and Operation*, the integral diagnostics capabilities of this system include Bit Error Rate Testers (BERTs) on data ports, tone generators on analog voice ports, the ability to manipulate the analog leads and the digital signaling bits of voice circuits.

The ability to initiate loopbacks at various points in a circuit, coupled with the ability to generate and receive test signals and to collect performance and error information, enable the operator to systematically troubleshoot circuit problems. It allows the operator to determine if the problem resides in the system. Since all of these diagnostic tools can be operated from a remote VT100 terminal, troubleshooting begins immediately without dispatching an on-site technician.

12.3 User port Diagnostics

12.3.1 WAN Diagnostics

Software-initiated diagnostics on T1 WAN aggregates involve looping the WAN signal toward the network (line loopback) or the system (local loopback) and placing any one of the DS0 channels that make up the WAN signal in local loopback. The table below list detailed information on the diagnostic capabilities of the WAN ports.

Loopbacks	
On-port loopbacks	
T1 Line loopback Toward Network	Yes
T1 Local loopback Toward User	Yes
DS0 Channel loopback Toward Network	No
DS0 Channel loopback Toward User	Yes
In-Band loopback Code Generation	
Industry-Standard T1 Loop-Up Code	N/A
Industry-Standard T1 Loop-Down Code	N/A
In-Band loopback Code Detection	
Industry-Standard T1 Loop-Up Code	N/A
Industry-Standard T1 Loop-Down Code	N/A
Bit Error Rate Tester (BERT)	
Patterns Supported	
All 1s	Yes
All 0s	Yes
1:1	Yes
1:7	Yes
511	No
2047	No
3:24	Yes
QRSS	Yes
BERT Direction	
Toward User	No
Toward Network	Yes
Statistics Gathered by BERT	
Bit Errors (BE)	Yes
Errored Seconds (ES)	Yes
Severely Errored Seconds (SES)	Yes
Consecutive Severely Errored Seconds	Yes
Out of Synchronization Seconds (OOS)	Yes
Bit Error Rate (BER)	Yes
Elapsed Seconds (ELAP)	Yes

12.3.2 Voice Diagnostics

The software-initiated diagnostics supported are voice ports include the setting of both analog and digital loopbacks toward the network and the generation of Quiet Tone and a Digital MilliWatt signal on a port-by-port basis. The operator can also monitor and set the state of the analog leads of any FXS or E&M port. They can set and monitor the state of the ABCD signaling bits of the digitized voice signal. In cross-connect system, test functionality also includes the ability to generate test tones (300Hz, 1 kHz and 3 kHz) and transmit those toward the user side or the network side of the system. The table below shows detailed information on the diagnostic capabilities of the Voice ports.

	4-wire E&M	2-wire FXS
On-port loopbacks		
Analog Toward Network	Yes	Yes
Digital Toward Network	Yes	Yes
Signaling Manipulation		
Set Status of Analog Interface Leads	Yes	Yes
Set Transmit ABCD Signaling Bits	Yes	Yes
Set Receive ABCD Signaling Bits	Yes*	Yes*
Monitor Status of Analog Interface Leads	Yes	Yes
Monitor Status of Transmit ABCD Signaling Bits	Yes	Yes
Monitor Status of Receive ABCD Signaling Bits	Yes	Yes
Tone Generation		
Tone Supported		
300 Hz	Yes*	Yes*
1 kHz	Yes*	Yes*
3 kHz	Yes*	Yes*
Quiet Tone	Yes	Yes
Digital MilliWatt	Yes	Yes
Tone Direction		
Toward User	Yes	Yes
Toward Network	Yes	Yes

12.4 .System with Cross-Connect Option

12.4.1 Circuit Diagnostics

In systems equipped with Cross-Connect CPUs, the cross-connect element adds another level of testing within the node and enhances the system's diagnostic capabilities. The operator may also monitor and set the state of the Transmit and Receive ABCD signaling bits of a digitized voice circuit that is cross-connected between WANs. The table below shows detailed information on the diagnostic capabilities of the circuits.

	Voice without Signaling	Voice with Signaling	Single Data DS0 (64 Kbps)	Super-rate Data (N x 64 Kbps)
Loopbacks				
Local loopbacks				
Toward WAN1	Yes	Yes	Yes	Yes
Toward WAN2	Yes	Yes	Yes	Yes
Bit Error Rate Tester (BERT)				
Patterns Supported				
All 1s	Yes	Yes	Yes	Yes
All 0s	Yes	Yes	Yes	Yes
1:1	Yes	Yes	Yes	Yes
1:7	Yes	Yes	Yes	Yes
M_OOS	Yes	Yes	Yes	Yes
BERT Direction				
Toward WAN1	Yes	Yes	Yes	Yes
Toward WAN2	Yes	Yes	Yes	Yes
Tones Supported				
300 Hz	Yes	Yes	Yes	Yes
1 kHz	Yes	Yes	Yes	Yes
3 kHz	Yes	Yes	Yes	Yes
Tone Direction				
Toward WAN1	Yes	Yes	Yes	Yes
Toward WAN2	Yes	Yes	Yes	Yes

	Voice without Signaling	Voice with Signaling	Single Data DS0 (64 Kbps)	Super-rate Data (N x 64 Kbps)
Signaling Manipulation				
Toward WAN 1				
Set Transmit ABCD Signaling Bits	N/A	Yes	N/A	N/A
Monitor Status of Transmit ABCD Signaling Bits	N/A	Yes	N/A	N/A
Monitor Status of Receive ABCD Signaling Bits	N/A	Yes	N/A	N/A
Toward WAN 2				
Set Transmit ABCD Signaling Bits	N/A	Yes	N/A	N/A
Monitor Status of Transmit ABCD Signaling Bits	N/A	Yes	N/A	N/A
Monitor Status of Receive ABCD Signaling Bits	N/A	Yes	N/A	N/A

12.5 Benefits of Built-In Diagnostics

The real power of the integral diagnostics of the Integrated Access System can be fully appreciated when the individual diagnostic tools are applied to everyday troubleshooting such as the one illustrated in the following example.

The environment shown in Figure 12-1 consists of two integrated access devices connected by a T1 line. These are referred to as the Local IAD and the Remote IAD respectively. At the local IAD, the DTE equipment is a co-located device providing a 56 Kpbs V.35 interface that is connected to a V.35 HSU port. At the Remote IAD, an OCU-DP port that interfaces to the 4-wire DDS tail-circuit extends the 56 Kbps to a third location. Consequently, the Remote IAD is equipped with an OCU-DP port that interfaces to the 4-wire DDS tail-circuit. At the third location, the DDS circuit terminates in a generic, third-party DSU/CSU which in turn provides a 56 Kbps V.35 interface to the remote DTE device.

The system operator can use the diagnostic tool kit to systematically troubleshoot the problem on an end-to-end basis and to identify the faulty sub-system, even if it is external to the Integrated Access System. One way to systematically troubleshoot the problem is illustrated in Figure 12-1. While there are many other approaches, in general, the procedure to follow is to combine loopbacks that are generated either through software commands or via industry-standard loop-up codes with Bit Error Rate Tests (BERTs) for data circuits, or test tones for voice circuits. In the Integrated Access System, all of those tools are available as integral features of the system and of the various ports. Each test determines if a specific sub-system is operating properly. In our example, after each test, the sub-systems that are shown to be functioning properly are shaded in gray.

In Figure 12-1, the local HSU port is put in Local loopback and a BERT test is run from the DTE. If successful, in Figure 12-1, diagnostics-3 the loopback sequence is advanced by putting the T1 link of the Local Integrated Access System in Local loopback and running BERT test again. This also tests the cross-connect element of the local Integrated Access System if there is one present.

In Figure 12-1, diagnostics 4, the E1 link of the remote Integrated Access System is configured in Line Loopback. Alternatively, a loop up code can be sent from the local Integrated Access System to put the E1 link of the remote Integrated Access System in Line loopback. This process is repeated until the remote DTE is put in network loopback and tested as shown in Figure 12-2, diagnostics 8.

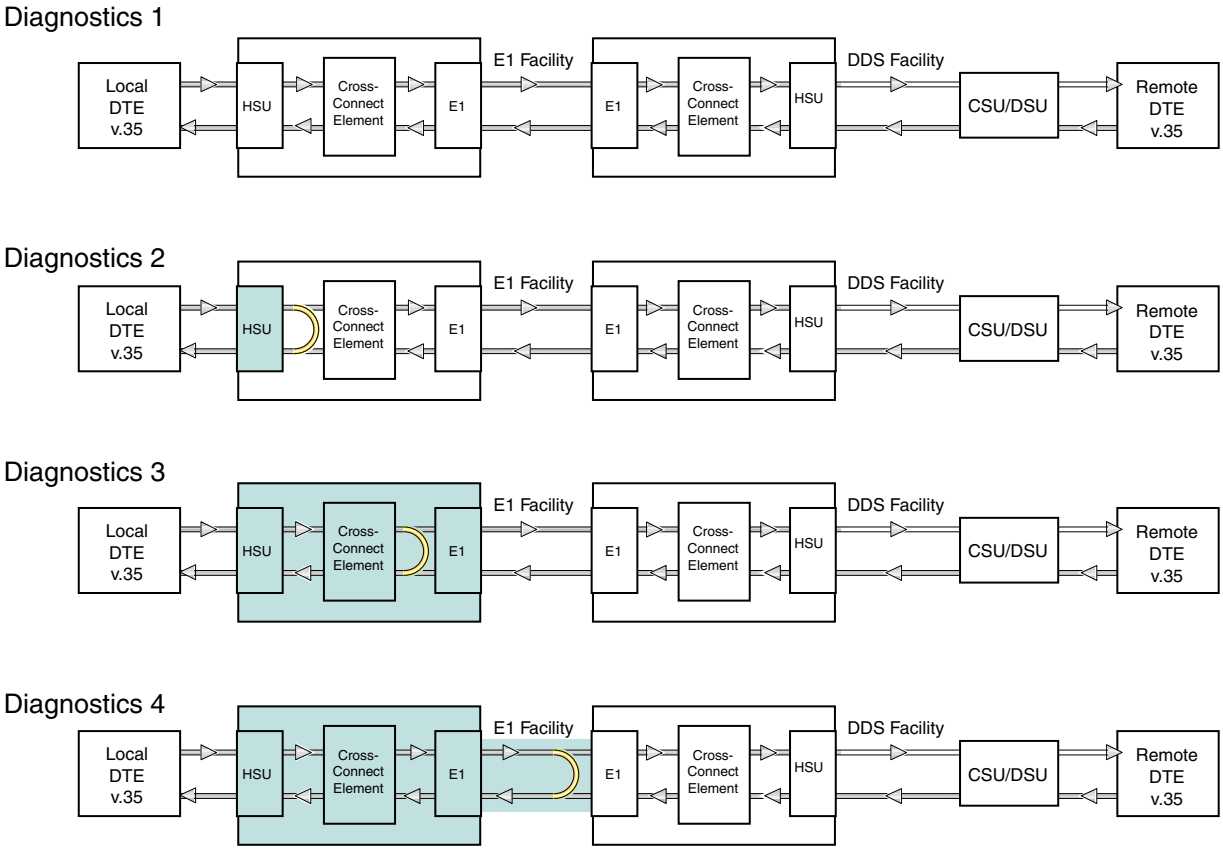


Figure 12-1.Built-In Diagnostics Example (Diagnostics 1 - 4)

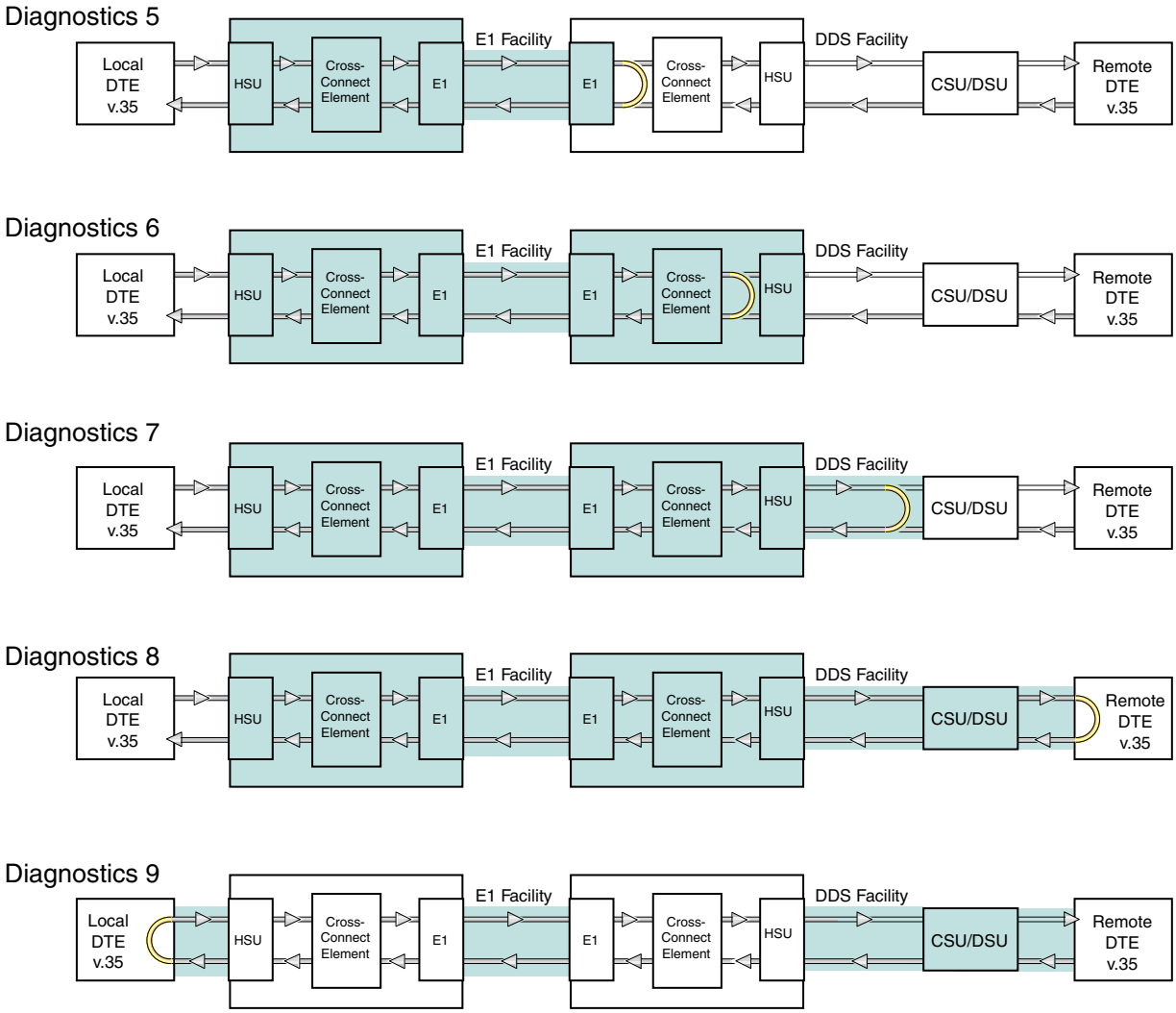


Figure 12-2.Built-In Diagnostics Example (Diagnostics 4 - 8)

Appendix A
System Standards and Specifications

A.1 Introduction

This appendix lists the Integrated Access System IMACS-200 standards, specifications, compliance, power sources and pre-installation settings for the user ports.

A.2 Standards Compatibility

The following is a comprehensive list of standards that the System Chassis, Common Equipment and User ports comply to, or are compatible with.

Chassis		
ANSI	310-D	Racks, Panels, and Associated Equipment
Bellcore	GR-63-CORE Issue 1	Network Equipment-Building System (NEBS) Level 3 Requirements: Physical Protections
	GR-1089-CORE Issue 2	Network Equipment-Building System (NEBS) Level 3 Requirements: Electromagnetic Compatibility and Electrical Safety
	TR-NWT-000295 Issue 2	Isolated Ground Planes: Definition and Application to Telephone Central Offices
CEN	EN 500 081-1	Electromagnetic compatibility generic emission standard Part 1 Residential, commercial and light industry.
	EN 500 082-1	Electromagnetic compatibility generic immunity standard Part 1 Residential, comicality and light industry.
	EN 60 950/A2	Safety of information technology equipment including electrical business equipment
UL	1459	UL Standard for Safety of Telephone Equipment
CSAC22.2	No. 950	Safety of information technology equipment including electrical business equipment
FCC	Part 68 - Subpart B	Requirements for Connection of Terminal Equipment Systems and Protective Apparatus to the Telephone Network.
IEC	297-1	Racks, Panels and Associated Equipment
	950 A2	Safety of information technology equipment including electrical business equipment
Power Supplies		
CEN	EN 60 950/A2	Safety of information technology equipment including electrical business equipment
CSA	C22.2, No. 950	Safety of information technology equipment including electrical business equipment
UL	1459, 3rd edition	UL Standard for Safety, Telephone Equipment
CPU		
Bellcore	GR-63-CORE Issue 1	Network Equipment-Building System (NEBS) Requirements: Physical Protections

CEN	EN 500 081-1	Electromagnetic compatibility generic emission standard Part 1 Residential, commercial and light industry
CEN	EN 500 082-1	Electromagnetic compatibility generic immunity standard Part 1 Residential, commercial and light industry
CEN	EN 60 950/A2	Safety of information technology equipment including electrical business equipment
UL	1950	UL Standard for Safety of Information Technology Equipment
CSA	C22.2, No. 950	Safety of information technology equipment including electrical business equipment

Interface ports		
ITU-T	V.28	Electrical characteristics for unbalanced double-current interchange circuits
	G.703	Physical/Electrical Characteristics of Hierarchical Digital I/F
	V.22 bis	2400 bits per second Duplex Modem Using the Frequency Division Technique
EIA	EIA 5618 Position Non-Synchronous	Interface between DTE and DCE Employing Serial Data Interchange
	RS232-C	Interface between DTE and DCE Employing Serial Binary Data
Bellcore	GR-63-CORE Issue 1	Network Equipment Building System (NEBS)
CEN	EN 500 081-1	Electromagnetic compatibility generic emission standard Part 1 (Residential, commercial and light industry)
	EN 60 950/A2	Safety of information technology equipment including electrical business equipment
FCC	Part 68 - Subpart B	Requirements for Connection of Terminal Equipment Systems and Protective Apparatus to the Telephone Network
UL	1459	UL Standard for Safety of Telephone Equipment
	1950	UL Standard for Safety of Information Technology Equipment
CSA	C22.2, No.950	Safety of information technology equipment including electrical business equipment

WAN ports		
AT&T	TR43801	Digital Channel Bank Requirements & Objectives
	TR54016	Requirements for Interfacing Digital Terminal Equipment to Service Employing the Extended Superframe Format
	TR62411	Accunet T1.5 Service, Description and Interface Specifications
Bellcore	TR-TSY-000008	Digital Interface Between the SLC 96 Digital Loop Carrier System and a Local Digital Switch (Issue 2 08/87)
	TR-TSY-000191	Alarm Indication Signal, Requirements and Objectives
ANSI	T1.101	Synchronization Interface Standards for Digital Networks
	T1.107	Digital Hierarchy - Formats Specifications
	T1.403	ISDN, Network-to-Customer Installation - DS1 Metallic Interface
	T1.408	ISDN Primary Rate
ITU-T	G.703	Physical/Electrical Characteristics of Hierarchical Digital I/F
	G.704	Synchronous Frame Structure Used at Primary and Secondary Hierarchical Levels
	G.732	Characteristics of Primary PCM Multiplexed Equipment Operating at 2048 Kbps.
	G.735	Characteristics of Primary PCM Multiplexed Equipment Operating at 2048 Kbps and Offering Synchronous Digital Access at 384 Kbps and/or 64 Kbps
	G.736	Characteristics of A Synchronous Digital Multiplex Equipment at 2048 Kbps

	G.823	The Control of Jitter and Wander Within Digital Networks which are based on the 2048 Kbps Hierarchy
	G.824	The Control of Jitter and Wander within Digital Networks which are based on the 1544 Kbps Hierarchy

Safety and EMC of WAN ports		
Bellcore	GR-63-CORE Issue 1	Network Equipment-Building System (NEBS) Requirements: Physical Protection
UL	1950	UL Standard for Safety of Information Technology Equipment
CSA	C22.2, No. 950	Safety of Information Technology Equipment including Electrical Business Equipment
	EN 500 081-1	Electromagnetic compatibility generic emission standard Part 1 Residential, commercial and light industry.
	EN 500 082-1	Electromagnetic compatibility generic immunity standard Part 1 Residential, commercial and light industry.
	EN 60 950/A2	Safety of information technology equipment including electrical business equipment
FXS ports		
AT&T	TR43801	Digital Channel Bank Requirements and Objectives November 1982
	TR-NWT-000057	Functional Criteria for Digital Loop Carrier System - January 1993
	GR-63-CORE	Issue 1 - Network Equipment-Building System (NEBS) Requirements: Physical Protection
ITU-T	G.712 (11/96)	Transmission Performance Characteristics of Pulse Code Modulation 9replaces G.712, G.713, G.714 and G.715)
	Q.552	Transmission Characteristics of 2-wire analog interface of a Digital Exchange
	Q.553	Transmission Characteristics of 4-wire analog interface of a Digital Exchange
FCC	Part 68 and Part 15 - Subpart B	Subpart B supersedes Subpart J
UL	1459, 3rd edition	UL Standard for Safety Telephone Equipment

E&M ports		
Bell System	TR433801	Digital Channel Bank Requirements and Objectives - November 1982
	TR-NWT-000057	Functional Criteria for Digital Loop Carrier System - January 1993
	GR-63-CORE Issue 1	Network Equipment-Building System (NEBS) Requirements: Physical Protection
ITU-T	G.712 (11/96)	Transmission Performance Characteristics of Pulse Code Modulation (replaces G.712, G.713, G.714 and G.715)
	Q.552	Transmission Characteristics of 2-wire analog interface of a Digital Exchange
	Q.553	Transmission Characteristics of 4-wire analog interface of a Digital Exchange
FCC	Rules and Regulations	Part 68 and Part 15 - Subpart B (Subpart B supersedes Subpart J)
UL	1459, 3rd edition	UL Standard for Safety Telephone Equipment
UL	1950	UL Standard for Safety of Information Technology Equipment
CEN	EN 500 081-1	Electromagnetic compatibility generic emission standard Part 1 Residential, commercial and light industry
	EN 500 082-1	Electromagnetic compatibility generic immunity standard Part 1 Residential, commercial and light industry
	EN 60 950/A2	Safety of information technology equipment including electrical business equipment

A.3 Chassis Standards

A.3.1 Dimensions

Chassis Description	Model Number	Height		Width		Depth		Weight	
		in	cm	in	cm	in	cm	lb.	kg
Chassis with Installation Kit, Dual-Powered, Steel Chassis, CE Marked	IMACS-200	3.47	8.8	9.48	24.1	17.31	44.0		

Note: *Weight is weight of empty chassis with backplanes and power distribution channel.*

A.3.2 Chassis Power

Chassis Description	Model Number	AC Power (50-60 Hz)		DC Power		Power Consumption
		110 VAC	220 VAC	-48 VDC	-125 VDC	Watts
Chassis with Installation Kit, Power-Enhanced, Steel Chassis, CE Marked	IMACS-200	115 VAC 104 to 135 VAC	175 VAC to 264 VAC	-40 VDC to -60 VDC		125 (typical) 500 W (maximum)

A.3.3 Environment

A.3.3.1 Ambient Temperature and Humidity

Ambient temperature and humidity as per GR-63-CORE R4-6 and R4-7.

Temperature ^{o} C / ^{o} F			Humidity	
Operate	Short Term	Storage	Operate	Short Term
0 to 50 ^{o} C 32 to 122 ^{o} F	-5 to 50 ^{o} C 23 to 122 ^{o} F	-20 to 80 ^{o} C -4 to 176 ^{o} F	50 to 95% relative humidity, non condensing	5 - 90 (not to exceed 0.024 kb H_2O/kg dry air)
Rate of temperature change		30 ^{o} C/hr (54 ^{o} F/hr)		

Ambient refers to conditions at a location 1.5 m (59 in) above the floor and 400 mm (15.8 in) in front of the equipment. Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1year. This refers to a total of 360 hours in any given year, but, no more than 15 occurrences during that 1 year period.

A.3.3.2 Altitude

As per GR-63-CORE R4-8. Functional within the limits specified in the table above when installed at elevations between 60 m (197 ft.) below sea level and 1800 m (5905 ft.) above sea level. As per O4-10. Functional within the limits specified in the table above when installed at elevations between 1800 m (5905 ft.) and 4000 m (13,123 ft.) above sea level.

A.3.3.3 Airflow

The IMACS-200 includes two fans. The fans are temperature controlled to automatically turn on and off as needed.

A.3.3.4 Fire Resistance

As per GR-63-CORE Section 4.2.2.2 Shelf-Level Fire-Resistance Criteria R4-19 for **Firespread** R4-20, **Fire Propagation** R4-21, O4-22 and O4-23.

A.3.4 Equipment Handling

A.3.4.1 Packaged Equipment Shock Criteria

As per GR-63-CORE Section 4.3.1.1 for category A containers, R4-41.

A.3.4.2 Unpackaged Equipment Shock Criteria

As per GR-63-CORE Section 4.3.2 R4-43.

A.3.5 Earthquake, Office Vibration and Transportation Vibration

A.3.5.1 Earthquake

To Zone 4 Profile (Zone 4 is most severe so equipment also meets Zones 0, 1, 2, and 3 criteria). Physical performance as per GR-63-CORE Section 4.4.1.2 R4-44. Functional performance as per GR-63-CORE Section 4.4.1.2 R4-48 and R4-49.

A.3.5.2 Office Vibration

Physical performance as per GR-63-CORE Section 4.4.3.2 R4-56. Functional performance as per GR-63-CORE Section 4.4.3.3 R4-57.

A.3.5.3 Transportation Vibration

Physical performance as per GR-63-CORE Section 4.4.4.1 R4-58.

A.3.6 Cable/Power Connections

- Chassis Model CHAS - front panel

A.3.7 Mounting

A.3.7.1 Types

EIA 19” (482 mm) Standard Open Rack or Enclosed Cabinet. WECO 23” Standard Open Rack or Enclosed Cabinet. Wall and Table Mount.

Clearance

Chassis	CHAS
Front	10” (25 cm)
Back	10” (25 cm)
Top	2” (5 cm)
Bottom	2: (5 cm)

A.4 System Power Supplies and Converters

The following is a list of standards for the Integrated Access System power supplies, converters and ring generators.

Model PS-DC DC Power Supply -48 VDC, CE Marked	
Input Voltage	-42 to -60 VDC
Inrush Surge Current	maximum 12 amp at 60VDC
Output Power	55 W Continuous
Max. No. per System	2
Redundancy	Optional
Ventilation	Convection cooled
Protection	Unit is fused protected from short circuits and over-voltage Unit is diode protected from reversed polarity
Approvals	EN 60950/A2, EN 50 081-1, EN 50 082-1, UL 1459, UL 1950, CSA-C22.2 No. 950

A.5 port Specifications

A.5.1 Dimensions and Power Consumption

Item										Power	
Common Equipment	**Model**									**Watt**	**BTU/hr**
Interface port	892360									.85	2.90
Network ports											
WAN port	WNA-1									1.1	3.75
Modules											
DSX/CEPT Module	CEPT									0.45	1.54
Voice ports											
E&M port	E&M-4 W									3.5	11.94
FXS port	FXS									9.7	33.12

A.5.2 port Current Measurements

port Name and Description	+5VDC Stndby	+5VDC Active	-5VDC Stndby	-5VDC Active	+12VDC Stndby	+12VDC Active	-12VDC Stndby	-12VDC Active
WAN, Single, DSX, T1	219	235	0	0	0	24	0	0
WAN, Single, CEPT E1-75 Ohms	209	226	0	0	0	24	0	0
WAN, Single, CEPT E1-120 Ohms	207	224	0	0	0	24	0	0
WAN, Dual, CSU	287	340	0	0	0	48	0	0
WAN, Dual, DSX T1	252	286	0	0	0	48	0	0
WAN, Dual, CEPT E1-75 Ohms	360	393	0	0	0	48	0	0
WAN, Dual, CEPT E1-120 Ohms	358	391	0	0	0	48	0	0
E&M, 8 Channels	73	84	72	70	17	104	16	16
E&M, 8 Channels, Extended TLP	73	84	72	70	17	104	16	16
FXS, 4 Channels, 600 Ohms	37	45	35	34	20	65	15	15
FXO, 8 Channels, 600 Ohms	89	99	77	75	16	105	15	15
BRI, U-Interface	168	643	0	0	4	4	0	0
BRI, U-Interface	145	667	0	0	6	6	0	0
MCC Server	N/A	1550	0	0	0	0	0	0
Interface with Modem	N/A	136	N/A	0	N/A	11	N/A	0
Interface	N/A	80	N/A	0	N/A	25	N/A	8

A.6 FCC Requirements

The three tables below outline the FCC Registration Information for Part 1, Part 2 and Part 3 for these system ports.

Reg. Status	MTS/WATS Interfaces	Model #	Ringer Equiv. Number	SOC	Network USOC	Canadian Jacks
M	02LS2	FXO	0.4B (ac), 0.0 (dc)	-----	RJ11X	CA11X
M	02GS-2	FXO	0.4B (ac), 0.0 (dc)	-----	RJ11X	CA11X
Reg.	02LS2	INTF-8P-M	0.8B (ac), 0.0 (dc)	-----	RJ11X	CA11X

Reg.	Analog PL Interfaces	Model #	SOC	Network USOC	Canadian Jacks
Reg.	0L13C	FXS 2W*8-6	9.0F	RJ21X	CA21A
Reg.	02LR2	FXS 2W*8-6	9.0F	RJ21X	CA21A
Reg.	TL11M	FXS 2W*8-6	9.0F	RJ2EX	CA2EA
Reg.	TL12M	FXS 2W*8-6	9.0F	RJ21FX	CA2FA
Reg.	TL11E	E&M 2W*8, E&M 4W*8	9.0F	RJ2EX	CA2EA
Reg.	TL12E	E&M 2W*8, E&M 4W*8	9.0F	RJ2FX	CA2FA
Reg.	TL31M	E&M 2W*8, E&M 4W*8	9.0F	RJ2GX	CA2GA
Reg.	TL32M	E&M 2W*8, E&M 4W*8	9.0F	RJ2HX	CA2HA
Reg.	TL31E	E&M 2W*8, E&M 4W*8	9.0F	RJ2GX	CA2GA
Reg.	TL32E	E&M 2W*8, E&M 4W*8	9.0F	RJ2HX	CA8HA

Reg.	Digital Interfaces	Model #	SOC	Network USOC	Canadian Jacks
Reg.	04DU9-BN	WAN SINGLE, WAN DUAL*	6.0Y	RJ48	CA81A
Reg.	04DU9-DN	WAN SINGLE, WAN DUAL*	6.0Y	RJ48	CA81A
Reg.	04DU9-1KN	WAN SINGLE, WAN DUAL*	6.0Y	RJ48	CA81A
Reg.	04DU9-1SN	WAN SINGLE, WAN DUAL*	6.0Y	RJ48	CA81A
Reg.	04DU9-1ZN	WAN SINGLE, WAN DUAL*	6.0Y	RJ48	CA81A
Reg.	04DU9-BN	WAN SINGLE, WAN DUAL**	6.0P	N/A	---
Reg.	04DU9-DN	WAN SINGLE, WAN DUAL**	6.0P	N/A	---
Reg.	04DU9-1KN	WAN SINGLE, WAN DUAL**	6.0P	N/A	---
Reg.	04DU9-1SN	WAN SINGLE, WAN DUAL**	6.0P	N/A	---

A.7 UK Requirements

Clearance (mm)	Creepage (mm)	Voltage Used or Generated By Host or Other ports
2.0	2.4 (3.8)	Up to 50Vrms or VDC
2.6	3.0 (4.8)	Up to 125Vrms or VDC
4.0	5.0 (8.0)	Up to 250Vrms or VDC
4.0	6.4 (10.0)	Up to 300Vrms or VDC
For a host or other expansion port fitted in the host, using or generating voltages *greater* than 300V (rms or DC), advice from a competent telecommunications safety engineer must be obtained before installation of the relevant equipment.		Above 300Vrms or VDC

A.8 Year 2000 Compliance

All products are compliant with Bellcore Requirements GR-2945, *Year 2000 Generic Requirements: Systems and Interfaces*. The following key points about this compliance are noteworthy:

1. All dates displayed or printed by the Integrated Access System are used for reference purposes only. No calculations, except leap year calculations (see number 3 below), are based on these dates.

2. The displayed or printed dates use implicit century indications. In other words, years are displayed as two digit numbers and because the dates are assumed current, or near current, the century is implied. Since all dates are shown for reference purposes only, and are normally used by maintenance personnel to monitor system performance over a short time frame, the implicit century indication presents no confusion, miscalculation or potential ambiguity.

3. Leap year calculations are handled correctly under all circumstances except one: century years not evenly divisible by 400 will be falsely computed as leap years. The year 2000 is evenly divisible by 400 and the Integrated Access System correctly computes it as a leap year. The years 2100, 2200, 2300, 2500, etc. are all non-leap years, but the Integrated Access System will computer them as leap years.

4. Newer releases of the IMACS-200 software (e.g. release 5.x, etc.) will correctly accept the system set-up entry of February 29 as a valid date when the associated value for the year indicates a leap year. Release prior to February 12, 1997 will not accept that date as a valid entry under any condition, leap year or non-leap year. In all releases, operating Integrated Access System software will properly roll leap year dates from February 28th to the 29th and then March 1 without error.

Appendix B
Error Messages

B.1 Introduction

This appendix lists the IMACS-200 error messages. One of these messages may appear at the bottom of the screen when you enter a command, indicating that the system did not perform the requested action. This condition may have been caused by an operator error, absence of a port in the system, or other condition. If an error message appears, take the appropriate corrective action. For convenience, the system error messages are listed alphabetically.

A name must be assigned to Circuit ID field.

You must enter a name for the circuit before attempting this operation. Go to the Circuit ID field, type the desired name, and save it.

All blank prt report.

You chose the empty option setting for all four elements of the Print Alarm on the Interface port. This combination of settings is invalid and cannot be saved. Choose the proper option settings for these elements.

ASYNC/5 databits must have 2 stop or parity.

You have assigned an SRU port to an asynchronous circuit with 5 data bits, one stop bit, and no parity. This is an invalid combination of option settings. Either choose two (2) stop bits, or enable parity on that port.

Both WAN's cannot be in test mode.

You cannot use the test option on both sides of a cross-connect simultaneously.

Cannot be STDBY while BERT test is running.

You cannot change a port from the actv (active) state to the stdby (standby) state while the Bit Error Rate Tester (BERT) is running. You must end the BERT test first.

Cannot define any more XCON circuits.

The maximum number of cross-connect circuits is 99.

Can NOT delete circuit while test is active.

You must end the test in progress before deleting the circuit.

Cannot do it in Viewer mode.

You are logged in under the Viewer password, but that level of access does not allow you to perform the desired operation. Log out of the system, log back in under the Operator or Manager password, and repeat the command. Or, perform an operation that is permitted by the Viewer access level.

Cannot have REMOTE and LOCAL loopbacks.

You cannot place the port port in both a local loopback and a remote loopback simultaneously.

Cannot insert errors without BERT running.

You must start BERT testing before inserting bit errors.

Cannot switch non-compatible WANs.

The current WAN port arrangement does not support redundant WAN switching.

Cannot switch to a non-operational WAN.

You cannot switch to the selected WAN port because it is out of service.

Cannot use the same TS on different WAN.

You cannot assign an SRU port port to the same time slot on different WAN ports.

Card is not available.

You cannot test the port because it is faulty.

Channel test is available from WAN XCON screen.

To test a cross-connected voice circuit, go to the Cross-Connect Screen.

Circuit name must be entered.

You must enter a name for the cross-connect circuit before attempting this command.

Config. changes must be made from primary WAN.

You cannot make configuration changes to a redundant WAN port. This is allowed only on primary WAN ports.

Duplicate prt report element.

You have asked the Print Alarms option to print the same element twice.

Empty field is not allowed.

You cannot assign a blank password on the CPU port Main Screen. Always enter alphanumeric characters.

ENETBRI/PRI port is not installed or config.

An Ethernet BRI/PRI port is not present in the system, and is not configured.

ERROR found in the RESTORE file.

The system restoral failed due to a software error. Repeat the restoral, and call Technical Support if this message reappears.

Field can NOT be MODIFIED.

You cannot edit this field.

Group already taken.

This group is already assigned.

Illegal address and mask combination.

The combination of IP address and mask numbers you chose is invalid. Change either the IP address or mask number.

Illegal IP Mask.

The IP netmask number you chose is invalid.

Invalid character in Node Id.

The only valid characters for a Node ID are alphanumeric characters and the underscore.

Invalid date/time format.

You have entered an invalid date or time.

Invalid endpoint name.

The endpoint name you chose is invalid.

Invalid IP address.

The IP address you chose is invalid.

Invalid IP netmask.

The IP netmask you chose is invalid.

Invalid password for this command.

You cannot use the debug command from the System Test and Debug Screen without the proper password authorization.

Invalid secondary clock format.

You cannot assign an external clock source as the secondary system clock.

Invalid Timeslot.

When assigning time slots to user voice and data ports, you must choose time slot number 1 to 24 for a WAN T1 port.

Invalid user name.

User name must be a combination of alpha-numeric characters. Control characters, spaces, and special characters are not allowed.

Invalid WAN/SRVR.

You cannot assign services to an unavailable WAN or Server port.

IP Address must be unique.

The IP address is already assigned.

Local LB & Test Pattern can’t be ON together.

You cannot perform a loopback with a test pattern applied, and you cannot apply a test pattern if a loopback is active.

Modification can’t be saved while test is active.

You cannot make changes in this screen while a test is in progress.

Must have OOS status.

You cannot delete a port that has not been removed from the system. Remove the port first.

No changes while BERT is running.

You cannot change the port configuration while Bit Error Rate Testing is active. Turn the test mode off before making your changes.

No historical alarms.

You have selected the History command in the Alarm Screen, but no alarms exist in that log.

No more than two WANs in BERT test are allowed.

You can place only two WAN ports in the BERT test mode simultaneously.

No timeslot(s) specified.

You cannot activate a user port that doesn't have any WAN time slots assigned to it.

Not implemented yet.

You cannot use a feature or function that is not yet released. This message normally appears on software versions for beta testing.

Not supported.

This command is currently not supported by the system.

Number of TS from must be equal to TS to.

You cannot assign a time slot cross-connection with an unequal number of "from" (source) and "to" (destination) time slots.

OK to lose changes (y/n)?

Confirm **Y**es or **N**o if losing the changes entered is OK with you.

Only one port can be at 128K.

You cannot configure more than one port of the port for 128 kbps.

Parameters are not saved.

You have selected the Main command from the bottom of the screen without first saving your changes. Press "s" to invoke the Save command first.

Parameters have been saved.

You have made changes to the port and typed "s" to invoke the Save command. (This is a normal message, it always appears when you type "s" to save changes.)

Password minimum is 6. Use letters AND numbers

Passwords must be at least six characters long and contain both letters and numbers. A minimum of one number must be used.

Password mismatch.

The password verification box did not match the original box.

Performance statistics not available.

You cannot obtain performance statistics for this port or ports.

Port already configured for Remote Terminal.

This port is already configured for use with a remote terminal.

Port is in use.

You cannot make any changes to an active port.

Port is not configured for ASCII.

This port is not configured for ASCII operation.

Port is not configured for TCP/IP.

This port is not configured for TCP/IP operation.

Primary WAN is not operational.

You cannot switch from a redundant WAN port back to a primary WAN port if the primary port is still not operational.

RATE = 19.2 must have DATA = 8 for adpcm or hlink.

If you set the SRU port port rate to 19.2 kbps, you also must set the number of data bits for that port to 8.

Redundancy switchover is complete.

You have asked the system to switch to the redundant WAN port, and the switchover was successfully completed. (This is not an error message; it normally appears after you initiate the switchover.)

Redundant WAN is taken already.

You cannot switch to the redundant WAN port in slot WAN-4 if it is already in use from a previous WAN port switch.

Remote session active. Can’t change setting.

You cannot change this setting because a remote operator has accessed the system and is controlling it. Wait for that operator to log off and disconnect.

Restricted field.

You cannot access the Superuser password field on the CPU port Main Screen. This password is factory-assigned.

Selected circuit is under the test already.

The current circuit is already being tested.

Simultaneous loopback tests not allowed.

You cannot activate two or more loopbacks at the same time.

SNMP Options not available on this CPU.

The current CPU port does not support SNMP configuration.

SR TS overlapping.

The subrate circuit assigned does not allow enough space for a previously assigned circuit on the same subrate time slot. For example, if you have a 19.2 kbps device on subrate time slot 1 in b-5 framing, you cannot assign another 19.2 kbps circuit to subrate time slot 2, because the circuit on 1 actually occupies subrate time slots 1 and 2. You must therefore assign that other circuit to subrate time slot 3 or 4.

Switch request sent to port.

The system has sent your redundancy switchover command to the associated port.

Switchover must be made from the primary WAN.

You cannot switch to a redundant WAN port from another redundant WAN port. You can only switch from a primary port to a redundant port.

Test function is not available.

The selected test is not available on the current port.

Test in progress. No changes from this screen.

You cannot change any settings in this screen while a port test is in progress.

TS Connection must be specified.

You must specify a time slot connection for the WAN circuit.

Voice CPU is not responding.

The voice CPU is not working. Power down the system, then power it up again.

WAN must be active (no loopback) to run BERT test.

You must turn off all WAN loopbacks before starting a BERT test on a WAN port.

Xconnect table can be accessed from primary WAN.

You cannot access the WAN cross-connect information from a redundant WAN port. Do this from a primary WAN port instead.

Glossary

This Appendix lists the glossary of terms used in the telecommunications industry today.

AAL

ATM Adaption Layer

ABCD bits

The bits that carry signaling information over a T1 or E1 line.

ABR

Available Bit Rate

ACAMI

Alternate Channel AMI, transmitting data on every other DS0 in a DS1 to ensure ones-density.

ACO

Alarm Cutoff

ACS

Advanced Communications Server

ADPCM

Adaptive Differential Pulse Code Modulation

ADPCM port

A resource port used to compress voice or subrate data on a DS0.

ADSL

Asymmetric Digital Subscriber Line

aggregate

A single bitstream combining many bitstreams of lower rates.

AIS

Alarm Indication Signal

AIS/ALM

Alarm Indication Signal/Alarm

AIM

ATM Inverse Multiplexer

a-law

E1 companding standard used in the conversion between analog and digital signals in PCM

ALIS

Analogue Line Interface Solution systems.

AMI

Alternate Mark Inversion, a line coding format for T1 lines.

ANI

Automatic Number Identification

ANSI

American National Standards Institute

ASCII

American Standard Code for Information Interchange

ASK

Amplitude Shift Keying

ATM

Asynchronous Transfer Mode

AWG

American Wire Gauge (the size of an electrical wire)

B7R

Bit #7 Redundant

B7R port

A network port used to provide Network Management capability for the system.

B8ZS

Bipolar 8-Zero Substitution, a coding scheme that maintains minimum-ones density on a T1 line.

Baud Rate

A measure of transmission speed over an analog phone line

B-channel

In ISDN**,** a full-duplex, 64 kbps (“bearer”) channel that carries user data.

BECN

Backward Explicit Congestion Notification

BER

Bit Error Rate, the number of errored bits divided by the total number of bits.

BERT

Bit Error Rate Tester

BES

A Bursty Errored Second is any second with more than one and fewer than 320 CRC-6 (ESF), BPV (D4/D-frame), or CRC-4 (E1) errors

bit

Contraction of the words "binary" and "digit."

bps

Bits per second (not to be confused with Baud Rate)

BRI

Basic Rate Interface, (2B+D) in ISDN

BRITE

BRI Terminal Emulation

CAS

Channel-Associated Signaling, a means of conveying voice-circuit signaling over an E1 line.

CAS–CC

Channel Associated Signaling–Common Channel

CAS–BR

Channel Associated Signaling–Bit-robbing mode, used to convey voice-circuit signaling over a T1 line.

CBR

Constant Bit Rate

CCITT

Consultative Committee for International Telegraph and Telephone, now known as the ITU (International Telecommunications Union).

CCR

Current Cell Rate

CCS

Common Channel Signaling

CEP

Connection End Point

CEPT

Conference on European Posts and Telecommunications, a European standards organization.

CES

Circuit Emulation Service

CGA

Carrier Group Alarm, a condition that results from a network failure. Forces all voice circuits off-hook or on-hook until the alarm-causing condition is cleared and the CGA ends.

CLUE

Customer-Located Equipment

clear channel

A DS0 channel without formatting restrictions (i.e., uses the full 64 kbps bandwidth for data transmission).

CO

Central Office

channel bank

A device that places multiple voice and/or data channels onto a digital or analog carrier

CL

Connectionless Service

CPE

Customer Premises Equipment

CODEC

COder/DECoder (a device that encodes and decodes signals)

companding

Non-linear reduction of a signal, usually compressing the larger signal values

CRC

Cyclic Redundancy Check

CRC-4

CRC using four check bits

CRC-6

CRC using six check bits

CSA

Carrier Serving Area

CSC

Common Signaling Channel

CSU

Channel Service Unit, an interface to a T1 line that terminates the local loop.

CTE

Channel Terminating Equipment (Network)

CTS

Clear To Send, a lead on an interface indicating that the DCE is ready to receive data.

D4

A common T1 framing format, consisting of 12 frames. Also known as SF framing.

DACS

Digital Access and Cross-connect System (an electronic digital test access and patching system)

DCC

Data Communication Channel

DCE

Data Communications Equipment

DCS

Digital Cross-connect System

D-channel

Full-duplex, 16 kbps BRI channel or 64 kbps PRI ISDN channel.

DDS

Digital Data Service

d/i

Drop and Insert, one of the modes of operation for the WAN port.

DID

Direct Inward Dialing

DLC

Digital Loop Carrier

DLCI

Data Link Connection Identifier

DM

Degraded Minutes. Number of minutes with ES, UAS or LOS greater than zero (0).

DMA

Direct Memory Access

DPO

Dial-Pulse Originating

DPT

Dial-Pulse Terminating

DRAM

Dynamic Random Access Memory

DS0

Digital Signal - Zero, the standard bandwidth for digitized voice channels. Also referred to as a time slot.

DS0–A

Strategy for mapping a single low-speed data circuit to a single DS0.

DS0–B

Strategy for multiplexing two or more DS0-A low-speed data circuits onto a single DS0 (e.g., 5x9.6kbps, 10x4.8kbps or 20x2.4kbps).

DS1

Digital Signal, Level 1

DSL

Digital Subscriber Line

DSR

Data Set Ready

DSX

Digital Signal Cross-connect

DTE

Data Terminal Equipment

DTR

Data Terminal Ready

DX

Duplex Signaling

E1

Digital 2.048 Mbps line rate, widely used in countries outside the U.S. and Canada.

EFCI

Explicit Forward Congestion Indicator

ELAN

Emulated Local Area Network

EPROM

Electronic Programmable Read-Only Memory, stores firmware on plug-in modules of the system.

ES

Errored Seconds. The number of seconds for which BRI port has detected a NEBE or FEBE greater than zero (0).

ESF

Extended Superframe (24-frame sequence for a T1 line; consists of two superframes)

ESS

Electronic Switching System

E&M

Earth and Magnetic, or recEive and transMit. The signaling leads on inter-switch voice connections.

E&M port

An E&M voice port for this system.

ETS1

European Telecommunications Standards Institute

F4

Four-frame multiframe structure used in T1 signals.

FAS

Frame Alignment Signal

FCC

Federal Communications Commission

FDL

Facility Data Link, consists of every other framing bit of an extended T1 superframe. The FDL is used to convey performance data, line test/loopback status, and other parameters for an ESF-framed T1 line. The FDL rate is 4 kHz.

FE1

Fractional E1

FEBE

Far End Block Error, shows transmission errors detected by the far end equipment

FOTS

Fiber Optics Transmission Systems

frame

A delineated assembly of information, consisting of one sequence of 24 encoded channel samples (T1) or 32 channel samples (E1).

FS

Frame Signaling bits (T1 line).

FT

Frame Terminal bits (T1 line)

FT1

Fractional T1

FUNI

Frame User Network Interface

FX

Foreign Exchange, a line that goes from a CO or PBX beyond the PBX or the CO's normal service area.

FXO

Foreign Exchange - Office, performs analog to digital and digital to analog transmission at the CO.

FXS

Foreign Exchange - Subscriber or Station, an interface at the end of an FX line connected to a telephone or PBX. Performs digital to analog and analog to digital transmission at the station end.

FXS port

One of the voice ports for this system

Ground

A physical connection to the earth, chassis, or other reference point

HDB3

High-Density Bipolar Order of 3, three-zero maximum coding for E1 lines. Provides a fourth zero violation for data bytes.

HDLC

High-Level Data Link Control (bit-oriented protocol)

HDSL

High-bit rate Digital Subscriber Line

HSU port

High-Speed Unit port (one of the data ports for this system).

HMI

Host Management Interface

HOM

HDSL OEM Module

ICMP

Internet Control Message Protocol

IEC

Inter-exchange Carrier (also called **IXC**)

IMUX

Inverse Multiplexer

IMUX port

A resource port that gives users access to the ISDN network for bandwidth-on-demand applications.

inverted a-law

A variation of a-law encoding that provides a higher ones density on E1 lines.

IP

Internet Protocol

IPR

Internet Protocol Router

ISP

Internet Service Provider

ITU

International Telecommunications Union (previously known as CCITT [Consultative Committee for International Telegraph and Telephone])

ITU-T

International Telecommunications Union, Technical sector

IXC

Inter-exchange Carrier (also called **IEC**)

Kbps

Kilobits per second

LAN

Local Area Network

LANE

LAN Emulation

loopback

Path for returning a signal back to the point of origin for circuit testing

LOS

Loss Of Synchronization. Shows the number of seconds for which the BRI port detects LOS.

LSB

Least Significant Bit

LT

Line Termination

LULT

LT Like Unit

LUNT

NT Like Unit

MAC

Media Access Control

MBS

Nortel's Meridian Business Set. An electronic telephone set capable of handling the Meridian Digital Centrex features offered by DMS SuperNode Switch.

Mbps

Megabits per second

MDC

Meridian Digital Centrex

modem

Contraction of the words "modulator" and "demodulator"

MRD

Manual Ringdown

MSP

Maintenance Service Provider

MTS

Memory Time Switch

MTU

Maximum Transfer Unit

mu-law

T1 companding standard used in the conversion between analog and digital signals in PCM systems.

NEBE

Near End Block Error. Shows transmission errors detected by the near end equipment

Network port

A CPU port, Resource port, or WAN port used in this system.

NMS

Network management system, a computer used to control networks from a single location.

NNI

Network Node Interface

NOS

No-Signal Alarm

NRZ

Non-Return-to-Zero signal format

NT

Network Termination

NTU

Network Termination Unit, connects BRI station equipment to the integrated access system. Any standard 2B1Q (U interface) device that supports "nailed-up" (one or two B-channels) connections with no D-channel signaling.

OCU–DP port

Office Channel Unit - Dataport (one of the data ports for this system).

OOF

Out Of Frame, an indication that the system is searching for the framing bit pattern in the signal received from the network.

OOS

Out of Service, an indication that a system element has failed.

OSI

Open Systems Interconnection

PAM

Pulse Amplitude Modulation

PBX

Private Branch Exchange, a small phone switch inside a company.

PCM

Pulse Code Modulation

PDU

Protocol Data Unit

ping

A program used to test IP-level connectivity from one IP address to another.

PLAR

Private Line Automatic Ringdown

PLR

Pulse Link Repeater

POP

Point of Presence, usually a telephone carrier office.

POTS

Plain Old Telephone Service

PPO

PPhone Foreign Exchange Office port. An interface at the end of the FX line connected to DMS SuperNode Switch.

PPP

Point-to-Point Protocol

PPS

PPhone Foreign Exchange Station port. An interface at the end of the FX line connected to MBS.

protocol

Procedure or set of rules for communication between two devices.

PSTN

Public Switched Telephone Network.

PTT

Postal, Telephone, and Telegraph authority

PVC

Permanent Virtual Circuit

QAM

Quadrature Amplitude Modulation

RAI

Remote Alarm Indication

Red alarm

A local alarm on a T1 line, indicating that a major failure has occurred at this location.

robbed-bit

A type of analog signaling that occasionally “robs” information bits to convey encoded voice-circuit signaling.

RZ

Return-to-Zero signal format

SAP

Service Access Point

SES

Severely Errored Seconds

SF

Superframe, a T1 framing format consisting of 12 frames. Also known as D4 framing.

SLC Subscriber Loop Carrier, a Digital Loop Carrier (DLC).

SLIP

Serial Line Internet Protocol

SMDS

Switched Multi-megabit Data Service

SNMP

Simple Network Management Protocol

SONET

Synchronous Optical Network

SRU port

Subrate Unit port (one of the data ports for this system).

system

Often used as a synonym for the integrated access system.

TA

Terminal Adapter

TE

Terminal Equipment

T1

The North American DS1 transmission rate, 1.544 Mbps.

TAD

Test Access Digroup

TCP/IP

Transmission Control Protocol/Internet Protocol

TDM

Time-Division Multiplexing

TELNET

An application protocol offering virtual terminal service in the Internet suite of protocols.

time slot map

Specification of the connections between all incoming and outgoing lines connected to the system. A cross-connect map allows users to split the bandwidth of T1 and E1 lines into amounts more suitable for normal voice and data communications.

TS

Time Slot

TSA

Time Slot Assigner

UART

Universal Asynchronous Receiver/Transmitter

UAS

Unavailable Seconds. Incremented by 10 when LOS has remained for more than 10 consecutive seconds and incremented by 1 every second until LOS is removed.

UDP

User Datagram Protocol

UI

Unit Interval

UNI

User Network Interface

User port

A Voice port, Data port, or Alarm port.

VBR

Variable Bit Rate

VC

Virtual Channel

VCL

Virtual Channel Link

VP

Virtual Path

VPC

Virtual Path Connection

WAN

Wide Area Network

WAN port

Wide Area Network port (one of the ports for this system).

wideband

A bandwidth equal to many individual channels

X.50

CCITT (ITU) standard data transmission protocol.

yellow alarm

Remote alarm on a T1 line. A major failure has occurred at a remote location.

ZCS

Zero Code Suppression